A practice approach to experimental governance : Experiences from the intersection of everyday life and local experimentation

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Experiences from the intersection of everyday life and local experimentation

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ABSTRACT

This dissertation examines local experimentation from a practice theoretical perspective. By doing this, the dissertation bridges the gap between two fields of research: one relating to the governance of experiments and the other to the dynamics of practices. In this way the dissertation contributes to the timely issue of steering consumption in a more sustainable direction by utilising experiments and interventions at multiple societal levels – an issue attracting wide interest within both research and policy communities.

The dissertation focuses on the role of participants in accommodating novel technologies and services into their everyday lives, and the role of social interplay between individuals and their collectives in supporting or opposing the change and diffusion of practices. These factors – how everyday practices are linked together, how change in one practice affects other surrounding practices, and how individuals adjust and evaluate their performances with respect to social norms, expectations, standards and rules – are fundamental to both stability and change in practices.

The dissertation comprises of five articles that illustrate, firstly, what can be expected from a local experiment and what the role of each experiment is and, secondly, what can be learnt from an everyday practice perspective on experiments and how the experiments are accommodated into the system of everyday practices. The study draws on a meta-study on 25 papers on climate governance experiments and on three empirical case studies on local experiments in Jyväskylä, Finland.

This dissertation asserts that a practice approach and a participant perspective can provide new opportunities for experimental governance by illustrating the complexities of everyday practices and how to acknowledge them in experimentation. Although sustainability transitions require changes in practices as entities, a focus on the performances of practices is crucial for any intervention, as it sheds light on individual learning and experiences.

The findings highlight the interdependencies and path dependencies of practices, as well as the collective perceptions of normality steering understandings of acceptable or unacceptable actions. The results also demonstrate that the participants are active contributors in experimentation, adjusting the new configurations of elements and practices in the prevailing system and reflecting on their performances in relation to others. Addressing the dynamics between individual performers of practice and their communities in (re)producing practices, and then targeting the interventions at the collective underpinnings preventing (or accelerating) change might be the key to stabilising emerging, sustainable practices.

TIIVISTELMÄ

Tässä väitöskirjassa tutkin käytäntöteorian näkökulmasta paikallisia, kestävyyteen tähtääviä kokeiluja. Väitöskirjatutkimus nivoo yhteen kokeilevan hallinnan ja käytäntöjen dynamiikan tutkimussuuntia ja ottaa osaa niin poliittisesti kuin tieteellisestikin ajankohtaiseen keskusteluun kulutuksen ohjaamisesta kestävämpään suuntaan kokeilujen ja interventioiden keinoin.

Väitöskirja keskittyy kokeilujen osallistujiin: miten he ottavat uusia teknologioita ja palveluita käyttöön arjessaan ja miten yksilöiden sosiaalinen kanssakäyminen vaikuttaa käytäntöjen muuttumiseen ja leviämiseen. Useat käytäntöjen osatekijät – millaisista elementeistä käytännöt muodostuvat, miten ne kytkeytyvät toisiinsa, miten muutos yhdessä käytännössä vaikuttaa kokonaisuuteen ja miten yksilöt toimivat suhteessa yhteisössä vallitseviin sosiaalisiin normeihin, odotuksiin, sääntöihin ja merkityksiin – vaikuttavat siihen, miten pysyviä tai joustavia käytännöt ovat.

Tämä väitöskirja koostuu viidestä artikkelista, jotka käsittelevät sitä, mitä paikallisilta kokeiluilta voidaan odottaa ja millainen on kunkin kokeilun rooli kokeilukulttuurissa, sekä mitä arjen käytäntöjen tutkiminen kertoo kokeiluista ja miten kokeilut toimivat arjessa. Yksi artikkeleista on meta-analyysi ilmastonmuutoksen hallintaa kokeilujen keinoin käsittelevistä artikkeleista ja neljä muuta empiirisiä tapaustutkimuksia yhteensä kolmesta paikallisesta, kestävän kulutuksen kokeiluhankkeesta Jyväskylässä.

Väitöskirjan tulokset osoittavat, että käytäntöteoreettinen lähestymistapa sekä osallistujien näkökulma tarjoavat uudenlaisen perspektiivin kokeilevan hallinnan toimintatapoihin. Vaikka kestävän kulutustason saavuttaminen edellyttää käytäntöjen laajempaa muutosta, yksittäiset toimet käytäntöjen ilmentäjinä voivat auttaa ymmärtämään niitä kokemuksia ja tekijöitä, jotka ovat keskeisessä asemassa tässä muutoksessa.

Käytäntöjen keskinäiset riippuvuudet, historia, konteksti sekä kollektiiviset käsitykset normaaliudesta vaikuttavat käytäntöjen mahdollisuuteen muuttua kestävämmiksi. Tutkimuksen tulokset korostavat kuitenkin myös sitä, että osallistujat ovat kokeilujen aktiivisia toimijoita, jotka järjestävät ja organisoivat uusia käytäntöjen osia ja yhdistelmiä arjen kokonaisuuksiksi, ja peilaavat omia toimintatapojaan yhteisössä vallitseviin käytäntöihin. Tämän moninaisuuden ymmärtäminen voi auttaa kohdistamaan kokeilut tekijöihin, jotka joko tukevat tai estävät muutoksia, ja siten avata mahdollisuuksia uusille kokeiluille ja kestävien käytäntöjen luomiselle ja vakiinnuttamiselle.

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I was also lucky to have wonderful people as members of my thesis advisory committee. Tuula Helne's contribution in providing insightful comments on my plans and papers was invaluable, although the final focus of my dissertation was rather far from the initial themes. Tuula also made me justify my choices and helped me eliminate occasional meanderings, which was very valuable. There are no words to describe my gratitude to Eva Heiskanen for all her support, advice and collaboration during the past years. Without Eva, I might have found myself engaged in something totally different after the end of last year.

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My parents, Arja and Hannu, have always been very encouraging, no matter what the project I find myself involved in, and this dissertation is no exception. Thanks to all my friends for taking care of my social life outside academia. I am running short of words to express how grateful I am for having Veikko in my life. Thank you for commenting on virtually all my papers, abstracts, presentations, and ideas, for supporting and encouraging me whenever I needed it, and for bringing all the happiness in my life. Without you, this dissertation would not exist.

Senja Laakso

Helsinki, May 2017

CONTENTS

LIST OF ORIGINAL PUBLICATIONS

This dissertation is based on the following publications:

I. Laakso, S., Berg, A. & Annala, M. (2017). Dynamics of experimental governance: A meta-study of functions and uses of climate governance experiments. *Journal of Cleaner Production*, DOI: 10.1016/j.jclepro.2017.04.140

II. Laakso, S. & Lettenmeier, M. (2016). Household-level transition methodology towards sustainable material footprints. *Journal of Cleaner Production*, 132: 184–191.

III. Laakso, S. (*forthcoming*). Experiments in everyday mobility: Social dynamics of achieving a sustainable lifestyle. Unpublished manuscript.

IV. Laakso, S. (2017). Giving up cars – The impact of a mobility experiment on carbon emissions and everyday routines. *Journal of Cleaner Production*, DOI: 10.1016/j.jclepro.2017.03.035.

V. Laakso, S. (2017). Creating new food practices – A case study on leftover lunch service. *Food, Culture & Society*, DOI: 10.1080/15528014.2017.1324655.

The publications are referred to in the text by their roman numerals.

Article I was co-authored with Annukka Berg and Mikko Annala. The original idea for the article came from the work of Berg and Annala, but the author of this dissertation had the main responsibility for reviewing the theories, conducting the meta-study and writing the article. However, Berg made a significant contribution to the writing process in terms of clarifying the arguments and bringing her expertise to the article. Annala provided insightful comments on the article during the writing process.

Article II was co-authored with Michael Lettenmeier. Both authors were responsible for collecting and analysing the data: Lettenmeier had the main responsibility for conducting the calculations on natural resource use. He was also responsible for writing about the results on the calculations. The author of this dissertation conducted the interviews, and had the main responsibility for reviewing relevant theories and previous research.

LIST OF FIGURES AND TABLES

ABBREVIATIONS

CANEMU	Carbon Neutral Municipalities
FISU	Finnish Sustainable Communities
GHG	Greenhouse gas
INOGOV	Innovations in Climate Governance
IPCC	Intergovernmental Panel on Climate Change
MF	Material footprint
MIPS	Material Input Per Service Unit
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
SNM	Strategic niche management
TM	Transition management
TRW	Towards Resource Wisdom

1 INTRODUCTION

Human activity has become the main driver of global environmental change, and humanity has already exceeded many 'planetary boundaries' regarding, for example, biodiversity loss (Steffen et al. 2015). Despite the growing number of climate change mitigation policies, we have failed to reduce our greenhouse gas (GHG) emissions (IPCC 2014). The use of natural resources is at the highest level since records began (Bringezu et al. 2016; Wiedmann et al. 2015). In order to stay within the 'safe operating space' (Rockström et al. 2009), both decarbonisation and dematerialisation are thus necessary. Within years – not decades but years – we need to fundamentally change our ways of consumption. Systemic changes, however, occur slowly. In order to mitigate climate change and environmental degradation, we need to accelerate the shift towards sustainability at all levels of society. This dissertation explores the role of local experiments in this process.

Alongside international agreements and frameworks, we have seen the rise of a new form of climate governance in cities, towns and neighbourhoods as they attempt to respond to the time pressures of climate change by means of experimentation (Bulkeley & Castán Broto 2013; Hoffmann 2011). Experiments – inclusive, challenge-led and real-world initiatives promoting change through social learning (Sengers et al. 2016a) – and experimental governance have received attention in both research and policy as a reflexive way to find alternatives to the status quo and to intervene in the wicked problems of our time (see Berg 2013; Bulkeley & Castán Broto 2013; Evans & Karvonen 2014). The idea underlying experimentation is that producing and implementing new innovations and niche technologies, and changing structures, cultures and practices, may eventually lead to shifts in regimes and to a fundamental transformation towards sustainability (Geels & Schot 2010; Markard et al. 2012; van den Bosch & Rotmans 2008).

Within the past 10 to 15 years, the focus of research on sustainable consumption – defined here as the use of products and services that meets the basic needs and quality of life without jeopardising the needs of future generations (OECD 2002) – has shifted 'beyond behaviour change'. Instead of seeing behaviour as an outcome of an individual's values and attitudes, the practice approach reconceptualises behaviour as the 'observable expression of a social phenomenon' consisting of shared meanings, knowledge and competences and materials and infrastructure (e.g. Shove et al. 2012; Spotswood 2016; Spurling et al. 2013). Individual behaviour is thus a performance of a particular, shared practice. Consumption is not a practice as such; rather, it is "a moment in almost every practice" (Warde 2005: 137): the use of products and services is incorporated into the ways we wash our

clothes and take showers (Browne et al. 2013; Shove 2003), travel to work (Heisserer 2014) and cook for dinners (Warde 2016). Everyday life, and the mundane practices of which it consists, is the site where the individual meets society and the site where shifts towards sustainability might be initiated (Rinkinen 2015; Røpke 2001).

This dissertation strives to bring a practice theoretical perspective to the aims, means and mechanisms of experimental governance. By building specifically on the experiences of participants in local experimentation, the dissertation focuses on the preconditions necessary for (particularly local) policy makers to promote regime shifts via experimentation, and on the valuable new insights that a practice approach can offer such endeavours. Much of the experimentation occurs at the local level and has both a direct and indirect impact on people's lives. Understanding the participants' perspective is thus crucial to the widespread adoption of the practices piloted in social experiments, and these experiences deserve more attention in studies on experimental governance. However, the aim of the dissertation is not to revert to methodological individualism, but rather to complement the question of *how* practices change with the question of *why* they change or fail to change.

The dissertation is not guided as much by a single, 'grand' research question as by the need to understand the experiences of ordinary, local people in the midst of experiments that are changing the ways these people live their everyday lives. During the research process, this approach led to the analysis of the purposes, goals and uses of climate governance experiments, the observation a local project promoting sustainability by experimentation and in-depth studies of the practices of participants in social experiments. These endeavours have eventually been refined into the following research questions:

1. What can be expected from a local experiment? And, more precisely, what can an experiment achieve, and what is the role of each experiment in experimental governance?
2. What can be learnt from an everyday practice perspective on experiments? How do the participants adjust the experiments to their system of everyday practices?

This dissertation consists of five articles summarised below. Article I presents a meta-study and a theoretical model of climate governance experiments. Articles II–V are based on three empirical case studies on experimental projects conducted in Jyväskylä, Finland, which has acted as the arena for a number of experiments, varying from behavioural change interventions to changes in municipal services.

Article I is based on a meta-study that aims to draw together experimental approaches of various origins and answer the question of what can be expected from certain kinds of experiments. The 'triangle model of experimental governance' attempts to illustrate the multiple goals and uses of experiments and discuss their different roles, stressing that not all experiments need to be scaled up in order to contribute to governance processes. The model also acknowledges both the vertical and horizontal dynamics of experimental governance.

Article II describes the methodology used in the Future Household experiment. The project followed the approach of transition management, illustrating that the processes targeted for larger scale transition experiments can be 'zoomed in' to guide interventions at the level of individual households. The article emphasises that although significant changes in the resource intensity of everyday life are possible, maintaining these positive outcomes requires support. The article also acts as a blueprint for further interventions by providing a detailed description of the project.

Article III deepens the perspective provided by Article II and uses a practice theoretical approach to analyse how everyday life, and mobility in particular, changes due to experimentation. The article illustrates the significance of the social context in supporting or inhibiting change and the different ways mobility ties other practices together. The results also suggest that the participants can act as agents of change after the end of the experiment, illustrating the far-reaching impact of a small scale experiment as well as the active role of the 'targets' of experimentation.

Article IV introduces the project Give Up Your Car. Participants were encouraged to give up their cars by providing them with a six-month free travel card for local buses. The article analyses the processes of routinisation to understand how the new practice of bus use was (or was not) adopted by participants. The article suggests that instead of trying to overcome the insufficient service level of public transport through monetary incentives whose impact ends with the completion of the experiment, attention should be paid to reducing the need for driving and providing more support and services for a car-free life.

Article V focuses on an experiment aimed at reducing the amount of food waste in schools by providing 'leftover lunches' for people living nearby. The article demonstrates how the caterer and the participants approached the experiment from very different angles and how the framing of the experiment proved crucial for building meanings related to the service. As the experiment has spread throughout Finland, the article asserts that understanding the factors behind the popularity of the service – the perspective of the participants – is essential.

This dissertation illustrates the 'micro-politics' of everyday life and their implication for the 'macro-politics' of experimentation and climate governance. The small, bottom-up experiments and strategic, top-down initiatives are intermingled and experienced at the level of the everyday lives of ordinary people. Experimental governance approaches thus need to pay closer attention to the way practices are performed, the way new technologies and services are embedded in the lives of the people performing the practices, as well as the way experimentation affects the internal and external social dynamics of a household and people's feelings about it. A focus on practices can help policy makers understand the conditions and complexities underlying stability and change and the reasons experiments are (or are not) successful – and thus the transformative potential of experiments.

In the following, Chapter 2 presents the theoretical framework of the research and provides an outline to the key notions of practice theory and those of experimental governance and experimentation at the local level. The concluding section of this chapter summarises the practice theoretical insights for experiments and the elements of an effective experiment from the practice theoretical perspective. Next, Chapter 3 gives a brief overview of how the culture of experimentation is promoted in Finland. The chapter also introduces the context of the study – the Towards Resource Wisdom project in Jyväskylä – and how experiments were used to promote local sustainability. Chapter 4 then summarises the materials and methods used, first, in the meta-study on climate governance experiments, and second, in three case studies on local experiments in Jyväskylä. Chapter 5 answers the research questions presented above by summarising the key findings of the studies and next, Chapter 6 moves on to discuss the implications of this research for experimental governance by using the experiences of participants to bridge the two theoretical approaches: dynamics of practices and experimental governance. Finally, Chapter 7 presents some concluding remarks and discusses the contributions of this study to research and policy. The chapter also offers some suggestions for further studies on practices and experimentation.

2 THEORETICAL FRAMEWORK

This chapter introduces the theoretical background of the research: practice theory and its contribution to steering consumption onto a more sustainable path (Section 2.1), experimental climate governance and the central mechanisms of experimentation (Section 2.2) and the practice theoretical perspective on experiments (Section 2.3).

2.1 PRACTICE THEORY AND STEERING SUSTAINABLE CONSUMPTION

As many scholars note, there is no coherent paradigm for theories of practice; rather, there are a "number of approaches united by some common ideas" (John et al. 2016: 135) about phenomena termed 'practices' or 'social practices'. The roots of practice theory are widespread, although the term 'practice theory' is not always used (see e.g. Shove et al. 2012). The history of practice research can be divided into three 'waves': the first wave consisting of the writings of Bourdieu, Foucault and Giddens (see Shove et al. 2012), the second wave of the work of Reckwitz (2002), Schatzki (2001; 2002), Shove (2003; 2010a) and Warde (2005), who introduced practice theory to (sustainable) consumption research, and finally the third, more empirically oriented, wave of research, which has carried practice theory to a wide range of domains, including household energy use (Gram-Hanssen 2011), mobility (Hui 2012; Kent & Dowling 2013; Article IV), and eating (Halkier & Jensen 2011; Warde 2016; Article V).

The practice theoretical approach to exploring methods of intervention in social life has been largely driven by the need to overcome the deficits of the "mainstream paradigm in pro-environmental consumer-oriented change attempts" (Keller et al. 2016: 77). Most of these mainstream approaches assume that people individually recognize and change their behaviour, whereas governments and other institutions act as enablers whose role is to induce people to make pro-environmental choices (Hargreaves 2011; John et al. 2016; Shove 2010a). These approaches marginalise other possible analyses and might even distract researchers and policy-makers from addressing the social and economic factors which give rise to unsustainable practices (Shove 2010b). Many scholars working with practice theory attempt to demonstrate the weaknesses of these streams of thought (e.g. McMeekin & Southerton 2012; Spurling et al. 2013; see Keller et al. 2016 for a further review),

a further review), highlighting that it is practice not opinions or attitudes that affects the environment (Bartiaux 2008).

In practice theory, a practice is the unit of analysis. Thus, the defining characteristic of practice theory is that it focuses neither on individualistic behaviour nor on structures; rather, it chooses a middle way, understanding actions as the product of social and shared practices. Practices can be (and are in this dissertation) defined as routinised behaviour guided by "shared understandings, know-how and standards of the practice, the internal differentiation of roles and positions within it, and the consequences for people of being positioned relative to others when participating" (Warde et al. 2007: 364). Practices can thus be understood as 1) consisting of the elements that hold them together, and 2) as entities reproduced by performances, which 3) are 'carried' by individuals.

Practices are generally treated as *configurations of elements*, and there are different typologies of these elements (see Gram-Hanssen 2011). In the definition proposed by Reckwitz (2002: 249), practices consist of interconnected elements of "forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge". Schatzki (2002: 77), in turn, defines practices as "doings and sayings" that are linked through practical understandings (routines and embodied know-how of what to say and do), rules, principles, precepts and instructions, teleoaffective structures (ends, goal-orientations, projects, tasks, purposes, beliefs, emotions and moods) and general understandings (such as forms of environmental consciousness or religious beliefs). Shove et al. (2012; also Shove & Pantzar 2005) suggest a typology where practices consist of materials (artefacts, technical or other media), meanings (normative structures, and cultural and collective conventions) and competences (skills and know-how) that are integrated when practices are performed. What is common to all these definitions is that practices involve the combination of elements in the context of socio-technical systems, institutions, cultural conventions and modes of spatial and temporal organisation (Evans et al. 2012; Southerton 2013) – for example, eating as a practice consists of elements such as knowing how and when to have certain meals (e.g. lunch) in the proper space with the appropriate people (Warde 2016).

Practices are interconnected by the elements they share with surrounding practices. Practices shape each other and might connect to form complexes or bundles of practices that "depend upon each other -- in terms of sequence, synchronisation, proximity or necessary coexistence" (Shove et al. 2012: 87) and in which practices intersect, overlap and co-evolve, but also compete for resources, such as time (Southerton 2006). Eating practices, for instance, are linked to the dynamics of food preparation and preservation, grocery

shopping, and food waste practices (Evans 2012; Warde 2016; Article V), whereas mobility practices glue together the practices of working, shopping and taking children to day-care (Aro 2016; Shove et al. 2015; Articles III; IV). When analysing practices and their connections, it is helpful to operationalise them on the basis of elements: a practice may be both supported and discouraged by the orchestration of the parts of a whole, and practices change when one or more of the elements holding together a practice change (Kent 2015; Leray et al. 2016; Sahakian & Wilhite 2014).

Another characteristic of practices is the notion of *practices as performances and as entities*. As a performance, a practice is "a routinised type of behaviour" (Reckwitz 2002: 249). A focus on performances enables researchers to gather data on day-to-day activities, such as eating (Warde 2016; Article V), use of electronics (Gram-Hanssen 2010), or mobility (Aro 2016; Articles III; IV). As members of social groups perform a practice in a (more or less) similar manner at any given moment, it can be described as an entity: a recognisable, intelligible, and describable pattern sustained over time and extended beyond individual instances of action (Birtchnell 2012; Shove & Walker 2007); in other words, it is an "entity which can be spoken about" (Shove et al. 2012: 7). Practices as entities have a history and a trajectory – a path of collective development. For instance, Shove (2003; see also Shove et al. 2015) has written about the co-evolution of the technologies and infrastructures, competences, meanings and temporalities that intersect in the practices of showering and private driving. These trajectories of practices also illustrate the construction of normality and depict the historical development of the standardisation of 'unsustainabilities'.

Practices thus simultaneously represent forms of inertia and transition that are located both in practices as entities and their performance (McMeekin & Southerton 2012). Practices are relatively stable and "temporally unfolding" (Schatzki 2002: 72) entities; consequently, habitual forms of action are continually reproducing and extending practices temporally. Nevertheless, as Warde (2005: 140) notes, "performances in the same practice are not always the same"; rather, performances of a given practice can vary between individuals, social groups and contexts. There is, for instance, considerable variation between nations in the patterns of eating at home and eating out (Warde et al. 2007), as well as in the meanings and understandings of mobility between the performers of mobility-related practices (Hui 2013; Article III), despite their being engaged in the 'same' practice.

In practice theory, individuals are seen as the *'carriers' of practices*. In other words, practice theory shifts *agency* from individuals to practices and focuses on the qualities of a practice rather than the qualities of an individual (Reckwitz 2002). Wants, needs and emotions, as well as other elements constituting practices, belong not to individuals but to the practices

themselves, and the contexts of everyday life are 'structured' by the practices and their routine performances (Shove et al. 2015; Warde 2005). As every agent carries diverse practices, the individual is seen as the "crossing point of practices" (Reckwitz 2002: 256). Practices spread when (or if) they manage to 'recruit' new carriers, they are maintained and reproduced through 'faithful performances', and they disappear when they are displaced by new practices (Shove 2003; Shove & Pantzar 2005). Individuals should not, however, be seen as passive carriers. For a practice to be performed, the actions need to make sense to the individual. Schatzki (2002: 75) calls this practical intelligibility, a phenomenon that governs actions by specifying what an actor "does next in the continuous flow of activity". Warde (2005: 141) notes that performers of practice can "experiment, adapt and improvise" when performing the practice, creating possibilities for the practice to change. In addition, practices are often performed in social groups, and individuals need to be able to participate in social interplay and evaluate the performances with respect to normality and the standards of different social sites (Dubuisson-Quellier & Gojard 2016; McMeekin & Southerton 2012; Røpke 2009; Warde 2005).

The above-mentioned introduction to practice theory has already explored some issues regarding changes in practices and how consumption, reconceptualised as a "by-product of everyday life" (Strengers 2010: 5), could be steered onto a more sustainable pathway. Using the concepts of practice-as-performance and practice-as-entity, as well as the idea of practices consisting of interlinked elements, creates fruitful dynamics for studying ways of steering consumption. One interesting question concerns the stability and elasticity of practices (Dubuisson-Quellier & Gojard 2016; Hargreaves 2011; Mylan 2015; Southerton 2013). On the one hand, people seem to resist change once a particular routine has been established, highlighting the importance of past experiences and path-dependence in the reproduction of practices (see Evans 2012). On the other hand, people continuously change their ways of doing things, and, furthermore, there are individual differences in the routines that comprise any given practice (Gram-Hanssen 2008; Nijhuis 2013; Warde 2005).

2.2 MECHANISMS OF EXPERIMENTAL (CLIMATE) GOVERNANCE

In the context of sustainability transitions, experiments are seen as "important seeds of change" that may challenge the status quo and eventually steer development onto a more sustainable path (Sengers et al. 2016a: 15). Experiments have long been used in science, but social (or real-world) experimentation has broadened the concept, methods and understanding of

experimentation, and shifted the boundary between science and society. Instead of understanding experimentation in the formal, scientific sense, experiments have come to signify "purposive interventions in which there is a more or less explicit attempt to innovate, learn or gain experience" – as well as the attempt to know and manage cities (Bulkeley & Castán Broto 2013: 363-367).

There nevertheless remains variation in the understanding of experiments or experimental governance. Typologies of experiments can be based on, for instance, their theoretical roots, methodological emphasis, or normative orientation (see Sengers et al. 2016b for a comprehensive review). When it comes to 'government by experiment' (Bulkeley & Castán Broto 2013), 'experimentalist governance' (Sabel & Zeitlin 2012) or a 'culture of experimentation' (Berg et al. 2014; Farrelly & Brown 2011; Kivimaa et al. 2015), this dissertation follows the notions of Bulkeley and Castán Broto (2013): experimental governance is understood as promoting reflexivity and openness, providing opportunities to test novel alternatives on a bounded scale and encouraging multiple actors and communities to participate in the design of solutions to the problems they face – such as those of climate change and environmental degradation (see also Berg 2013; Article I).

In the sphere of climate governance, experiments imply a 'trial and error' approach to the creation, shaping or altering of the collective principles, norms and standards guiding our behaviour, in order to change the ways communities respond to climate change (Hoffmann 2011: 17). These approaches are often outside traditional channels of centralised authority. Local experimentation can thus make an important contribution to experimental climate governance. Networks of municipalities, such as C40 Cities (Trencher et al. 2016), Transition Towns (Seyfang & Haxeltine 2012) and Carbon Neutral Municipalities (Heiskanen et al. 2015), have sprung up with the aim of fostering a variety of co-existing experiments to reduce GHG emissions (Bayulken & Huisingh 2015; Seyfang & Haxeltine 2012).

These local actions can be seen as grassroots innovations developed at the community level (Seyfang & Smith 2007), protected spaces for social and technological experiments (Heiskanen et al. 2014), or living laboratories adapting new services and lifestyles to, for example, a building, street or neighbourhood (Voytenko et al. 2016; Article V), or to a household (Davies & Doyle 2015; Devaney & Davies 2016; Articles II; III). These experiments vary in size from small scale projects with a handful of participants to municipal-wide ventures with experiments within experiments (Devaney & Davies 2016; Heiskanen & Matschoss 2016; Heiskanen et al. 2015). Experiments can combine several technologies, infrastructures and social systems (Voytenko et al. 2016) and can be conducted in collaboration between different actors, such as research organisations, universities, local communities, firms and

organisations (Bulkeley & Castán Broto 2013; Hoffmann 2011). As these experiments are open-ended, actors have to deal with a high level of risk, complexity, uncertainty and lack of control (Brown et al. 2003; Rotmans et al. 2001; Sengers et al. 2016a). Moreover, their interests and goals may also vary: residents may be more interested in positive experiences, whereas other actors might place greater value on learning experiences, which also occur from errors (Heiskanen et al. 2015). Although these experiments are specific to a particular location and socio-cultural context, the purpose of experimentation is to create outcomes that are replicable, transferable and scalable to society at large – in other words, to contribute to sustainability transitions (Evans & Karvonen 2014; Luederitz et al. 2016; van den Bosch 2010; Voytenko et al. 2016).

Much of the research on experimentation follows the notions of transition management (TM, e.g. Loorbach 2010; Rotmans & Loorbach 2009; Rotmans et al. 2001) and strategic niche management (SNM, e.g. Kemp et al. 1998; Schot & Geels 2008). Both TM and SNM offer a managerial perspective on stimulating sustainability transitions through experiments (Raven et al. 2010; van den Bosch 2010). Whereas SNM approaches stress that experiments are the starting point for guiding future transitions in sustainable directions (Berkhout et al. 2010), TM highlights the importance of visioning as the basis of experimenting and emphasises the role of experiments as instruments to "explore and learn about sustainable and radically different ways of meeting societal needs" (van den Bosch 2010: 50). A core notion within TM is that the direction and pace of transformative change in societal systems can be influenced by a series or 'portfolio' of both top-down and bottom-up interventions at different levels using different instruments (Rotmans & Loorbach 2010; van den Bosch 2010). Conversely, SNM focuses on supporting the (bottom-up) emergence and development of niches through experimental projects, in which managing expectations, building social networks, and learning are the key processes (Kemp et al. 1998; Schot & Geels 2008). SNM aims to establish protected spaces for technological innovations and demonstration projects. Examples of such experiments range from testing electric vehicles (Brown et al. 2003) and piloting photo-voltaic systems in housing (Wieczorek et al. 2015) to projects such as the design of a transportation system or a sustainable city concept (Berkhout et al. 2010; Vergragt et al. 2014). Examples of experiments guided by TM, in turn, range from experimenting with new practices within households or home labs (Devaney & Davies 2016) to encouraging the use of public transport (van den Bosch & Rotmans 2008). What is important is the empowerment of 'frontrunners' or other key actors in facilitating the envisioned change.

Utilising a TM approach, van den Bosch and Rotmans (2008) identify three mechanisms through which experiments can contribute to sustainability transitions: deepening, broadening and scaling up. The mechanisms are based on shifts in culture (shared ways of thinking, values, paradigms, and perspectives), practices (habits, routines and doing things) and structure (the physical, institutional or economic context) (Rotmans & Loorbach 2010; van den Bosch & Rotmans 2008: 20).

The *deepening* mechanism refers to a learning process stemming from experimentation within a specific context. Learning is reflexive and entails changes in the assumptions, norms, identities and interpretive frames which govern the actions of individuals, communities and organizations, and which underlie a particular policy discourse (see Heiskanen & Matschoss 2016; Raven et al. 2010). Deepening can be stimulated by providing space and support for establishing and conducting experiments and by monitoring and evaluation (Sengers 2016). For instance, experiments promoting public transportation through financial incentives (see Thøgersen 2012) can contribute to a deeper understanding of public transport use and the conditions required for (or restricting) change.

The *broadening* mechanism is defined as repeating in different contexts the new or deviant constellation of culture, practices and structure (which is the outcome of deepening) and linking it to other domains, thus increasing its influence and stability (Grin 2010; van den Bosch & Rotmans 2008). Through broadening, a model, infrastructure or new way of thinking is spread or transferred within a certain context or to other contexts, or fulfils a wider range of societal needs: for example, existing networks of municipalities can be used to diffuse and test new ideas in different contexts to increase their effectiveness (Heiskanen & Matschoss 2016; van den Bosch & Rotmans 2008; Article V). The guiding principles of broadening are to use a sustainability vision for providing direction and to organise feedback loops between the experiments and the transition pathways (Raven et al. 2010).

Finally, the *scaling up* mechanism entails embedding the new constellation of culture, practices and structure promoted by a given experiment within the dominant societal system. Van den Bosch and Rotmans (2008) distinguish between scaling-up as an institutional expansion (from 'frontrunners' to incumbent organizations and 'regime-players') and both geographical scaling-out as diffusion of innovation within the same stakeholder groups and spatial scaling-up as widening the scale of operation. In all cases, transferring small-scale processes to a larger scale entails collaboration with more actors (Luederitz et al. 2016; Article II). However, Kivimaa et al. (2015) note that although deepening and broadening indeed occur as a result of experimentation, experiments only rarely succeed in disrupting the existing regime. Although there are examples of successful transition experiments

(see van den Bosch 2010), the main outcomes of such experiments are related to policy learning and institutional change, while changes in the practices of ordinary people often remain modest (Kivimaa et al. 2015).

2.3 EXPERIMENTATION FROM A PRACTICE THEORETICAL PERSPECTIVE

In this section, my aim is to combine the approaches of experimental governance and practice theory. As outlined above, experimental governance has attracted interest as a means of accelerating sustainability transitions. Van den Bosch & Rotmans' notions of deepening, broadening, and scaling up (2008) provide a fruitful starting point for analysing the processes through which experiments become mainstream, or as Geels (2011: 37) puts it, how emerging, fluid practices (niche) become stable and routinised practices (regime). Although experimental governance scholars acknowledge the place of practices in transitions (see van den Bosch & Rotmans 2008), practices are merely understood as a concept of human action. Approaching experiments from the perspective of practice theory, instead, could provide insights into *how* and *why* practices actually change (or fail to change).

Thus far, innovations such as electric cars, and the policies supporting these technologies, have often left existing travel patterns and mobility needs intact. This can limit the potential for change and unwittingly encourage or lock-in unsustainable practices (Røpke 2009; Spurling et al. 2013). In addition, interventions solely targeting individual elements, such as informational measures (e.g. providing feedback on energy use) or motivational strategies (e.g. goalsetting and commitment-making) have rarely translated into actual emission reductions (see Capstick et al. 2014). Spurling et al. (2013) suggest that experiments should target practice entities – reframing the question of how to change individuals' behaviours as how to change practices and their performance (Evans et al. 2012; Welch 2016).

According to Spurling et al. (2013), from a practice theoretical perspective there are three options for interventions. Firstly, *re-crafting practices* is to reduce the resource-intensity of existing practices through changing the elements which make up the practices. This, however, does not mean subscribing solely to a technological view where new applications solve problems; rather, what is called for is an investigation of how products, technologies and services co-evolve with use and how different elements are interconnected (Gram-Hanssen 2011; Shove 2003; Spurling et al. 2013). Examples of re-crafting practices could be related to changing driving behaviour through normalising fuel-efficient driving, or reducing food waste

by creating new ways to distribute and serve food (Spurling & McMeekin 2015; Article I).

Secondly, *substituting practices* begins with the question of what a practice is for: daily mobility, for instance, is not just defined by whether we want to use a car but by a series of interconnected activities and constraints (Chatterton et al. 2015; Articles III; IV). Shove and Walker (2010) describe how a congestion charging scheme in London that also included a parallel programme of investment in public transport significantly reduced the use of private vehicles – a practice of private driving was thus substituted with other mobility practices.

Thirdly, *changing the ways practices are interlocked* targets the whole complex of practices. This intervention is closely related to previous ones, as the linkages between elements holding practices together play a central role in all interventions. Spurling's et al. (2013) example of new 'community hubs' providing working spaces that reduce the need for commuting and address the challenges of working from home provides an example of changing how practices interlock. Addressing interdependent, co-evolving (yet seemingly unrelated) practices thus provide 'clues' for the way the practice is shaped and creates space for a more holistic intervention (see Kent 2015).

An effective experiment informed by practice theory would begin with an adequate understanding of the practices that need to change, including their connections, and would then identify the range of interventions necessary to change the practice elements, recruiting all the actors involved in shaping these elements, before finally implementing a coordinated programme to "disrupt, relocate, innovate, redirect or otherwise reorient" the practices in question (Strengers et al. 2015: 74). However, despite illustrating practical examples of successful interventions, Spurling et al.'s (2013) model provides no answers to why experiments shape (or fail to shape) practices: why do people engage in a new practice or why do they adhere to their old routines? Moreover, what are the effects of practice substitution, for instance, on other everyday practices and how do these changes, in turn, affect the overall aim of sustainability gains (Evans et al. 2012; Gram-Hanssen 2011; Shove & Walker 2010)?

What experimental governance approaches and interventions targeting practice entities are thus unable to capture is the complexity of everyday practices – and as Hargreaves et al. (2013) caution, it is important to be critical towards approaches, which seek to simplify and standardise this diversity. Focusing on the perspective of the performers of a given practice, or the participants in experiments, might provide some answers to the above-mentioned questions. As recognised by experimental governance scholars such as Sengers et al. (2016b) and van den Bosch (2010), further research is required into the types of learning experience that occur at the level of

individual actors due experimentation: what kind of shifts occur in thinking, intentions, and commitments, as well as in the behaviour, routines and structures that are (re)produced by actors, and how personal competences, characteristics and identities influence the outcomes of experiments. Heiskanen et al. (2015) suggest that scholars and experimenters should attend to the social and personal reasons why local people might (not) want to engage in experimentation. Consequently, studies on experimentation could benefit from 'zooming in' on practice performances before 'zooming out' and intervening in these practices on a larger scale.

What then, from the perspective of the participant, happens in experimentation? During the experimentation process, people integrate certain elements of a practice in a new configuration. If this configuration spreads through its adoption by other people, a new practice may emerge as an entity (McMeekin & Southerton 2012; Røpke 2009). Manufacturers, producers and promoters are unable to fully control the reception of products and services; instead, consumers play a central role in the ways innovations affect the reproduction of daily life (Pantzar & Shove 2010; Shove & Pantzar 2005; Shove et al. 2012). In defining the relationship between a product or service and its user, questions of meanings, not only of competences and technologies, are central, as these elements need to be combined for a practice to work.

Whilst being active participants in experimentation, individuals nevertheless retain only limited control over the practices in which they engage. The concept of 'social interplay' (Røpke 2009), through which practices are constructed, can reveal some areas for further elaboration. People perform practices not only in their homes but in a variety of communities, and individuals are in constant interaction with other actors in these different communities. Practices emerge through activities performed "in front of others, together with others, and in relation to others" (Halkier 2013: 219). As experiments are, to a high degree, based on continuous participation (Luederitz et al. 2016), this interplay and (re)production of practices through small adaptations, negotiations and improvisations is an important factor in the diffusion of experiments. 'Normal and appropriate' consumption is usually formed, and reproduced, in specific settings (Aro 2016; John et al. 2016), and by participating in some practices but not others, individuals locate themselves in certain 'communities of practice' (Shove et al. 2012). Experiments typically assemble new networks of actors with knowledge, capabilities and resources who cooperate in a process of learning (Berkhout et al. 2010). However, experimental governance approaches often ignore the other networks and collectives to which participants in experimentation belong – networks which are important not only for capacity building and

broadening experiments, but also as references to which practices are regulated (Dubuisson-Quellier & Gojard 2016; Articles III–V).

Experiments should thus focus both on the way experimentation can embed new products, services and technologies in the system of everyday practices as well as on the way practices diffuse within and between the communities to which the participants belong. The circulation of elements and the elaboration of ideas, or changes in discourses on a smaller scale, may eventually lead to more profound changes (Berkhout et al. 2010; Kivimaa et al. 2015; Article I). Broadening or scaling up should not, however, be the self-evident aim of experimentation (Farrelly & Brown 2011; Hargreaves et al. 2013; Kivimaa et al. 2015; Article I). Considering the many possible transition pathways (Geels & Schot 2007; 2010), there is value in experiments serving as a testing ground for exploring alternative technologies and services and how they work (or fail to work) within a certain context. Laying the foundation for further experiments is important, as prior knowledge and past performances enable the adoption of new elements and their embedding within existing configurations – new technologies, for instance, cannot simply be 'dropped into' an unreceptive context (Heiskanen et al. 2013; 2015). A broad range of bottom-up experiments fulfil different roles and allow different types of innovation to be employed and tested. Interventions should also be used as part of broader activities and policies promoting and supporting change (Luederitz et al. 2016; Saikku et al. 2015; van den Bosch & Rotmans 2008).

To summarise, while experiments have become popular around the world and are positioned as drivers of wider transition, their impact is still poorly understood (Luederitz et al. 2016). As this section has demonstrated, understanding the potential for change requires recognition of the iterative relationship of practice as an (individual) performance and as a (collective) entity: to intervene in a performance is to intervene in an entity and vice versa. Studying experimentation from a practice theoretical perspective can raise understanding about how new products, services and technologies become embedded in the everyday lives of local people, and how new or changed practices spread to different contexts and become mainstream; moreover, it can reveal the role of experiments in these processes.

3 EXPERIMENTATION IN FINLAND AND THE TOWARDS RESOURCE WISDOM PROJECT

The promotion of experimental approaches has been high on the Finnish political agenda in recent years: the current Government Programme states that "the flexible renewal of Finnish society is supported by a management culture based on trust, interaction and experimentation." It also remarks that "bold steps have been taken to reform management and implementation by strengthening knowledge-based decision-making and openness and by making use of experiments and methods that encourage civic participation" (Prime Minister's Office, 2015: 27). Indeed, much has happened in Finland in recent years: a Government-led project to promote a culture of experimentation, Experimental Finland, has been established and a variety of new experimental projects, such as Dare to Experiment, coordinated by the Association of Finnish Local and Regional Authorities, are being run at the local level. [1] In addition, there are a number of other local projects, varying from smart energy experiments (Heiskanen & Matschoss 2016) to sustainable food consumption and management of food waste (Article V).

Although experimental governance is a relatively new concept in Finland, experiments have long played a part in Finnish environmental politics. Carbon Neutral Municipalities (CANEMU[2]) is an on-going project that began as early as 2008. CANEMU originally aimed to use small municipalities outside the Metropolitan Area as 'change laboratories' for new solutions to climate change (Heiskanen et al. 2015). The original initiative arose from cooperation between a business leader's social responsibility initiative and the Finnish Environment Institute. Five partner municipalities were originally selected; however, by the end of 2016 the number of municipalities had grown to 33. When joining the project, municipalities pledge to decrease GHG emissions generated within their territory by 80% from 2007 levels by 2030. These 'low-carbon forerunner communities' have shown that an experimental approach can bear fruit in terms of significant reductions in climate emissions and benefits for the local economy (Saikku et al. 2015): during the project, the CANEMU municipalities have reduced their GHG emissions by an average of 20% (Finnish Environment Institute 2013).

The positive experiences gained from the CANEMU network in Finland resulted in the application of a similar model to a network of resource efficient municipalities, or Finnish Sustainable Communities (FISU), in 2015.

[1] In Finnish the projects are called *Kokeileva Suomi* and *Uskalla kokeilla*.
[2] *Hiilineutraali kunta* (HINKU) in Finnish.

The FISU network is coordinated by the Finnish Environment Institute and Motiva (a Finnish state-owned expert company promoting the efficient and sustainable use of energy and materials), and there are eight participating municipalities. Visions and roadmaps towards sustainability work as tools in the network as the municipalities aim to tackle overconsumption, become carbon neutral and produce no waste by 2050 (or sooner). These tools were developed and initially tested in Jyväskylä in the Towards Resource Wisdom (TRW) project (2013-2015), coordinated by the Finnish Innovation Fund Sitra together with the City of Jyväskylä. Jyväskylä, with 137,000 residents, is the seventh largest city in Finland, the largest city in the region of Central Finland (Figure 1) and one of the fastest growing cities in the country. The concept of resource wisdom can be seen as a new method of framing sustainability as the "reasonable use of natural resources and cutting of emissions without compromising wellbeing" (Berg et al. 2014: 9).

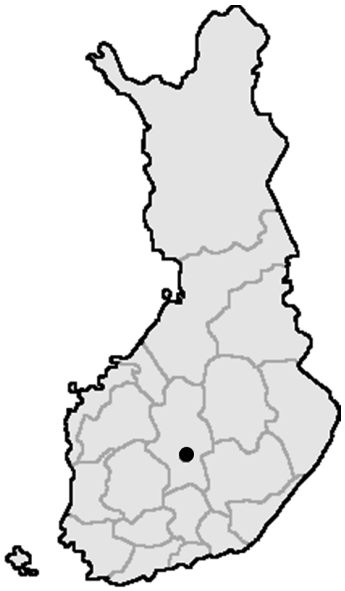

Figure 1. Location of Jyväskylä.

In the TRW project, experiments were used as the central means of finding concrete ways to promote sustainability at the local level (Berg et al. 2014). During the project, residents of Jyväskylä were invited to use a web portal to submit ideas on how to reduce harmful environmental effects and improve social and economic wellbeing. A total of 212 ideas were received, of which 14 were adopted (Table 1). Each of the resource-wise experiments received a maximum of 8,000 euros funding over a four-week period. A total of 25,000 people participated in testing these resource-wise ideas. In 2014 an evaluation of some of these experiments was performed (Mattinen et al. 2014). The evaluation covered reductions in environmental effects, particularly those concerning GHG emissions and the use of natural resources, and provided an estimate of the potential reductions to be gained if the experiments were scaled up and regularised (Mattinen et al. 2014).

Table 1. A list of experiments conducted in the TRW project in Jyväskylä (Mattinen et al. 2014).

Experiment	Key actor	Duration	Description
Leftover lunch	The City of Jyväskylä	2 weeks	Avoidance of serving losses (and thus GHG emissions) in canteens by providing 'leftover lunches'
Mass info	The City of Jyväskylä	8 weeks	An information service to prevent waste and reduce energy use in soil transportation
Try at least once	The City of Jyväskylä	1 day	Local public transport provided for free to promote bus use and reductions of GHG emissions
Green Care	The City of Jyväskylä	1 event	Workshops on community gardening and other activities to promote sustainable lifestyles, using a local farm as a 'resource wise' learning environment
Fixers' Market	Resident association	3 events	A meeting place for repairers and customers to extend the life cycle of products and prevent waste and to encourage the sustainable use of goods and employ small entrepreneurs
Help At Hand	Resident association	4 weeks	Helping people living outside the city by bringing services closer, and 'neighbour help' to reduce the need for driving and promote a sharing economy
Club space for all	Resident association	4 weeks	Encouraging the efficient use of space by providing a club space for people to use for free
Wisely lighted building	Housing association	3 months	Using participatory and interactive decision making processes during energy efficiency improvements to outside lights
Water-wise apartment building	Housing association	4 weeks	Creation of an operational model for housing associations to reduce the consumption of water (and thus the use of energy)
Less short car trips	Bicycle association	2 weeks	A competition to reward people for using bicycles instead of cars for short distances and change attitudes towards cycling
Shared equipment for sports	Sports association	4 weeks	Sharing sports equipment, spaces, rides and know-how between sports associations to save costs and energy and promote a sharing economy
Young Eco Agents	Environment association	1 event	A group of 13–18-year-olds organised an event on sustainable lifestyles to provide knowledge on sustainable consumption
Local food direct	Co-operative	4 weeks	Home delivery of food to facilitate the availability of local food, reduce the need for private vehicles and employ small businesses
Resource-efficiency myth busters	Motiva	-	Production of two videos to communicate resource wisdom (energy and material efficiency) to activate citizens

In addition to the experiments based on the ideas of residents, some additional projects and pilots were run. In one such project (Future Household), five households of varying size and representing different life situations took a 'leap into the future' by testing, over the course of one month, various ways of reducing the consumption of natural resources in their everyday lives (Articles II; III). The pilots were related to promoting public transportation in the Jyväskylä area (Bus Leap), reducing GHG emissions in four residential housing associations (Resource-wise housing) and developing an information service that would allow for more rational and efficient coordination of earth-moving projects (Mass Info). These pilot projects were more municipal-level and service-provider-led, and consisted of several smaller experiments that lasted from one day (such as free public transportation events) to one year (such as experiments related to housing).

In parallel with the experiments, a sustainability roadmap for the city was created during an integrated planning process involving public and private sector actors, policy makers, service providers, NGOs and experts. The roadmap was divided into six paths entitled the energy sector, transport sector, water management, food production and consumption, waste and materials management and everyday life in the future (Table 2). The desired outcomes, implementation steps and milestones for each path were planned by using the backcasting method (see Mont et al. 2014). After the backcasting workshop, the roadmap was subjected to more detailed calculations and impact assessments by experts, and revisions were made where appropriate.

New experiments are still being conducted in Jyväskylä, including projects to improve waste management and promote public transportation. In addition, some experiments, such as the leftover lunch service for schools, have been regularised. Resource wisdom was included in the City Strategy approved by Jyväskylä City Council in 2014 (The City of Jyväskylä 2014), and Jyväskylä joined the FISU network in 2015. The implementation of the City Strategy will be annually monitored, and resource wisdom indicators will be included in this monitoring. A resource wisdom working group of 25 people has been operating since the beginning of 2016 as part of the city administration.

Table 2. A summary of Jyväskylä's roadmap to resource wisdom (The City of Jyväskylä 2015).

	2015–2016	2017–2019	2020–2025	2030	2050
Renewable energy	Kangas area as an R&D platform and reference area	Energy efficient residential areas	1–2 wind power parks. Kangas solar power plant	Carbon neutral production of electricity and heat	Carbon neutral energy production
Sustainable transport	New solutions for light traffic and the use of mass transit and private vehicles	Biogas and charging stations for electric vehicles. Renewable fuels in buses	Smart solutions to combine different ways of commuting	Popular and rapid public transport will connect population centres	Fossil free, carbon neutral transport
Waste as a resource	Biogas plant at Mustan-korkea. Industrial symbioses	Mustan-korkea eco-industrial park. Circular economy solutions	70% of municipal waste reused as material. New sharing economy solutions	Use of services and sustainable, fixable and recycled products	Sustainable use of materials
Healthy food	Public procurement supports local production. Leftover lunch gains ground	Meat consumption replaced by local seasonal vegetables	Easy and affordable local food and brands, substantial employment effects	Household food waste decreased by 75%. Meat consumption at sustainable level	Food production and consumption within one planet principle
Valuable water	Centre for water business	Closed loop circulation in industrial water processes. Water metering in individual households	Biorefinery at a wastewater treatment facility. Clean natural water part of the City brand	All fractions of waste water are utilised at the water treatment bio-refinery	Increasing water business
Sustainable communities	Forerunner in experimental governance. Resource Wise hospital	Resource Wisdom also taught in schools.	Green care, nature and wellness travel	Supporting smart technologies, sustainable living and entrepreneur-ship	A vital and attractive area for people and business

4 RESEARCH METHODOLOGY

This chapter presents the methodology of the research. Section 4.1 presents the meta-study on climate governance experiments, on the basis of which the triangle model of experimental governance was created. In turn, section 4.2 focuses on the three case studies on local experiments in Jyväskylä.

4.1 META-STUDY ON CLIMATE GOVERNANCE EXPERIMENTS

A meta-study of 25 articles on experimental climate governance (Article I) aimed to systematise the field of experimental governance by addressing two research questions: 1) How can experiments be conceptualised on the basis of their potential functions and uses? 2) How should the dynamics and transformative potential of experimental governance be understood?

4.1.1 MATERIALS AND METHODS

The 25 articles used in the meta-study were originally presented at an INOGOV (Innovations in Climate Governance) workshop titled Climate Change Policy and Governance: Initiation, Experimentation, and Evaluation. The workshop, which was held in Helsinki in March 2015, was developed to bring together the latest international and cross-disciplinary research focusing on climate governance experiments.

We divided the experiments into four groups denoting their potential functions and uses: testing, creating a profound influence, multiplying influence and promoting systemic change. This categorisation was performed on the basis of the authors' approach to the notion of experiments and on the manner in which the articles described any empirical data. This approach widens the scope of previous typologies reviewed as part of our meta-study and is partly based on previous work in the field of experimental governance in Finland (see Annala et al. 2016). The aim of the study was not only to propose another categorisation for experiments; in addition, the study strove to create criteria that were not tied to a specific theoretical tradition or methodology.

The typology ultimately broadens the scope of van den Bosch's (2010) mechanisms of deepening, broadening and scaling up. In line with the concept of a 'small experiment' (Irvine & Kaplan 2001), which provides a method of testing ideas and creating space for unscripted performances (McGuirk et al. 2015), the category of 'testing' was added to the model. In addition, broadening and scaling up are combined to form the category of

'multiplying influence', which captures the diffusion of the outcomes outside the niche. By contrast, 'promoting systemic change' refers to large-scale, strategic experiments that are scaled down towards the grassroots level rather than being the result of scaling up. In addition, instead of seeing these four categories as the mechanisms by which experiments can contribute to transitions, we define them as the goals of experimentation, illustrating what can be expected and gained from an experiment.

4.1.2 THE TRIANGLE MODEL OF EXPERIMENTAL GOVERNANCE

On the basis of the meta-study, we situated these experiment categories within a triangle model of experimental governance (Figure 2) in which we graphically position the goals of experiments and some of the key dynamics of experimental governance.

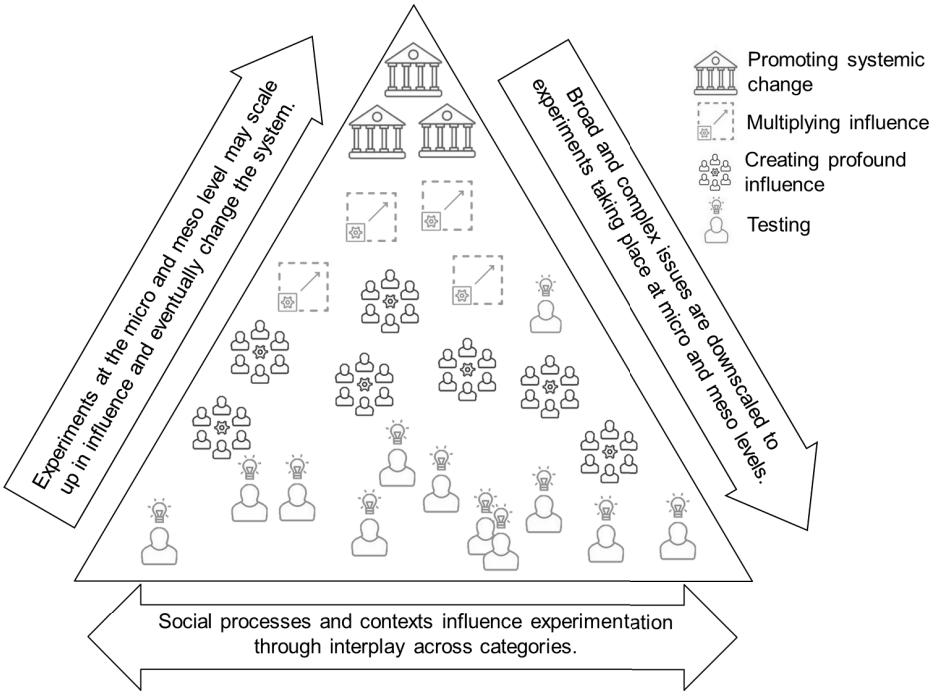

Figure 2. The triangle model of experimental governance (Laakso et al. 2017).

The triangle model provides a holistic framework for understanding the potential functions and uses of many types of experiments. The vertical dynamics of the model illustrate the growing influence and complexity of experiments but recognise that experimental governance occurs in both a

top-down and bottom-up manner: many projects grow in influence, but some also return to testing and fluctuate between different functions. The horizontal dimension encompasses the dynamics within and between experiments, highlighting the role of social processes and context-specific factors.

4.1.3 METHODOLOGICAL CONSIDERATIONS

Since INOGOV is a broad international network, the invitation to participate in the workshop reached a large number of researchers in the field of climate governance. The 25 articles selected for the workshop, and later for the meta-study, represented both theoretical and empirical research within different disciplines. The articles employ a wide range of conceptualisations for experiments, and thus they are representative of the broad field of experimental governance – as illustrated, for instance, by Sengers et al. (2016b). The articles also cover research conducted in several countries in Europe, Asia and the Americas.

Consequently, it seemed reasonable to conclude that the articles provide an adequately wide and multi-faceted array of perspectives on experimental climate governance. Nevertheless, the sample was small enough to be analysed in fine detail. Another option would have been to conduct a systematic search of articles in the Scopus database (following e.g. Kivimaa et al. 2015), but as the field of experimental climate governance is relatively new, tentative searches pointed to the same themes and authors as in the workshop articles. As the articles chosen for the meta-study were presented in a specific workshop, it is nevertheless possible that they fail to represent all the possible positions in a diverse field. Based on previous research, however, there is no reason to assume that serious systematic biases were present.

Most of the articles have since been published in the *Journal of Cleaner Production* and other related journals. The main restrictions on our selection criteria for articles was nevertheless related to their availability, as some have yet to be published.

4.2 CASE STUDIES OF LOCAL EXPERIMENTS

The empirical data were collected from the participants and organisers of the experiments in three case studies in the TRW project in Jyväskylä: Future Household, Give Up Your Car, and the leftover lunch service.

The Future Household project (Articles II; III) was a home lab project coordinated by Sitra and conducted by the consulting company D-mat ltd.

and the Big Plans Bakery think-tank. Five households – one single person, two students living together as housemates, two families with two and three children respectively, and one empty-nest couple – were chosen to represent different life situations, in order to provide a variety of examples of what more 'resource-wise' everyday life might resemble. The methodology of the Future Household (described in detail in Article II) followed the principles of TM (see Devaney & Davies 2016; Loorbach & Rotmans 2010) by defining a baseline and a goal, creating a specific framework to administer interventions, measuring the effects of interventions against the baseline and the goal, evaluating the effects against sustainability criteria and offering recommendations on how to mainstream solutions. The project began in spring 2014 with the selection of households, but the active stage of the project occurred in autumn 2014: the kick-off event took place in August, the experiment period in October and the final workshop with local public and private sector actors in November.

The Give Up Your Car project (Article IV) was organised by the City of Jyväskylä's public transportation operator, and it was one of the projects conducted under the umbrella of the Bus Leap pilot project, which aimed to increase the attractiveness of public transport in Jyväskylä. The experiment targeted (two-car) households interested in changing their prior mobility habits from driving to using buses, and the condition for participation was that the participants gave up (one of) their cars. The City of Jyväskylä offered the participants free travel cards for local buses in return. A total of 11 households of different sizes and life situations participated in the experiment. Four of them gave up the household's only car, while seven owned two cars and gave up the other. The experiment began in January 2015 and ended six months later in June.

The leftover lunch service (Article V) began as a two-week experiment in one primary school and one service center for elderly people in autumn 2013. Since the initial experiment, the service has been broadened to two other schools and made permanent in all three schools after the positive experiences of the caterer and positive feedback from the participants. Canteen workers at the service center, however, concluded that the free leftover lunch opportunity only made the customers shift their lunch hour later, and they did not continue the experiment (Mattinen et al. 2014). The study on the service was conducted in November 2015, two years after the experiment began in Jyväskylä. Unlike the other two other experiments studied, the leftover lunch project targeted school caterers: the main aim of the service is to minimise serving losses, and hence the amount of food waste created by school lunches. However, as studies on this experiment have demonstrated (Mattinen et al. 2014; Article V), the experiment was also significant for the diners.

4.2.1 MATERIALS AND METHODS

All the case studies can be described as qualitative, and they combined a variety of methods (Table 3), which can be divided into 1) procedures for estimating the environmental effects of the experiments, and 2) qualitative methods for capturing the experiences of the participants in each experiment.

Table 3. Summary of the informants, and materials and methods used in the research.

	Future Household (Articles II; III)	Give Up Your Car (Article IV)	Leftover lunch (Article V)
Informants			
Number of households	5	11	21
Number of participants [a]	13	28	29
Number of other actors	12	2	4
Materials			
Consumption survey	x		
Mobility diaries	x	x	
Food diaries	x		x
Media, social media, blogs	x	x	x
Methods			
Interviews with participants	20 (4 per household)		21
Interviews with other actors	12	2	4
Workshops and events	3		
Self-reporting		x	
Roadmaps	x		
Observation			x
Calculations			
Material footprints	x		
Carbon footprints	x	x	(x [b])

[a] Including all members of participating households.

[b] Calculations were performed by Mattinen et al. (2014).

The rigorous consumption survey conducted in the Future Household project to calculate the use of natural resources – the material footprints (MF) – of the participating households also included mobility and food diaries. This

survey template (see Laakso 2015 for a detailed description), or the relevant parts of it, was also used for data collection purposes in the two other case studies.

ENVIRONMENTAL EFFECTS OF EXPERIMENTS

The main aim of the experiments in the TRW project in Jyväskylä was to find concrete ways to reduce GHG emissions and the use of natural resources. Estimating the environmental effects of the experiments was thus a vital part of the projects. The results from two case studies are presented in Articles II and IV. The GHG emissions and natural resource use of the leftover lunch service (Article V) have been previously estimated by Mattinen et al. (2014). On the basis of their calculations, the estimated emission reduction per meal was 1.3 kg CO_2e, with an approximate 4.3 kg reduction in the natural resources used (Mattinen et al. 2014). Recovery of leftover food also reduces other life cycle impacts (such as eutrophication) due to the reduced overall demand for food. The authors also estimated that if the service was spread to all schools and corresponding facilities, it would lead to an over 2 million-kilogram reduction in food waste. This would mean a 9,000-tonne-reduction in GHG emissions and a 30,000-tonne-reduction in the use of natural resources (Mattinen et al. 2014).

In the Future Household project (Laakso & Lettenmeier 2015; Article II), material footprints were used to illustrate the amount of natural resource use, and carbon footprints were also calculated (see Lettenmeier et al. 2015). MF calculations are based on the concept of MIPS (Material Input Per unit of Service). MIPS represents the total amount of natural material input (MI) required throughout the life cycle of a certain product or service in order to provide a specific benefit (service, S). The MF is the sum of three resource categories: abiotic and biotic resources and topsoil erosion in agriculture, and it is expressed in mass units such as kilograms (Lettenmeier et al. 2009; Schmidt-Bleek 2000). On the basis of national material flow calculations (e.g. Seppälä et al. 2011), it is estimated that a sustainable level of natural resource use would be approximately 10 tonnes per person per year, of which private household consumption would account for eight tonnes per person per year and the rest would be attributed to public activities (Lettenmeier et al. 2014).

The aim of the project was to help households bring their material footprints closer to a sustainable level. A target for 2030 was used as a halfway point from the present to a sustainable level of eight tonnes by 2050. The first MF calculations were performed on the basis of a three-week consumption survey enquiring into housing, mobility, eating, leisure time activities, tourism and household goods. From this starting point, the target level for

2030 was calculated, and the households co-created ideas for achieving this level by using the method of backcasting (Mont et al. 2014). On the basis of these ideas, each household created a roadmap detailing the measures required to achieve the 2030 MF target. The households then chose some of the ideas on their roadmaps for implementation in a four-week experiment period. During the experiment period, MF calculations were again made to estimate the effect of the trials on the households' material footprints.

The material footprints of the households varied from 21 to 69 tonnes per person per year. The consumption components with most variation were everyday mobility, tourism and housing. Similar to previous studies (Hirvilammi et al. 2013; Kotakorpi et al. 2008; Laakso 2012), the number of cars per household, as well as the size of the dwelling, and thus the need for heating, explained most of the variation in the footprints. During the experiment period, each household strove to achieve their 2030 MF target. Despite some difficulties and insufficient time to realise all the plans on the roadmaps, every household succeeded in bringing their use of natural resource closer to their roadmap targets (achieving MF levels of 16 to 41 tonnes per person per year). The participants considered that the visualisations of material footprints for each consumption component were helpful for understanding differences in scale and for making non-reflexive, 'inconspicuous' consumption (Shove & Warde 2002) visible.

Carbon footprints were used to estimate the environmental effects of the Give Up Your Car project (Article IV). Each participant reported their daily mobility prior to the experiment, and completed a one-week mobility diary three times during its duration. In addition, the City of Jyväskylä's local public transport operator provided data on the participants' travel card use during the experiment. The carbon emissions for mobility were calculated on the basis of information from the diaries, complemented by the data from travel card reports, and by using Nissinen et al.'s (2013) emission coefficients. The participants' total GHG emissions decreased significantly during the experiment, the total reduction being an average of 43%. Nevertheless, the variation between households was high, as the starting levels of GHG emissions differed widely. Furthermore, while the reduction in emissions is unsurprising, as all the households gave up one car, those participants who still had one car also used it more efficiently, and many began walking and cycling more.

EXPERIMENTS AND EVERYDAY PRACTICES

The other part of the case studies follows the methods used in many (sustainable) everyday practices studies, including those related to the use of energy (Gram-Hanssen 2008; 2010), mobility (Heisserer 2014), and eating

(Dubuisson-Quellier & Gojard 2016). As studying practices empirically requires methodological versatility and openness (Keller et al. 2016), a range of methods and materials were used to support the analysis: in-depth interviews played the main role in the analysis, but a variety of other data were used to complement and support the interview material (Table 3).

In the Future Household project, the participating households were interviewed a total of four times. The first interviews occurred in June 2014 in the participants' homes, after the households had been chosen for the project. These interviews covered a broad range of themes regarding the everyday lives of the participants, their motivation for participating in the project and the areas of consumption under investigation: housing, mobility, eating, leisure time activities, tourism and household goods. The second interviews were conducted by phone after the households had received information on their material footprints and before the experiment period in October 2014. These interviews focused on the participants' reactions to the material footprint results. In turn, the third interviews were conducted in Jyväskylä after the experiment period and focused on the experiences of participants. The final interviews then occurred six months after the end of the project, in May 2015, and in these interviews we returned to the participants' experiences of the experiment and the possible changes in their everyday lives resulting from participation in the project. To complement the interview data, notes were taken from the project's three workshops: the kick-off event, the workshop in which the roadmaps were made and the final workshop. In addition, the consumption survey was used to support the analysis. The project also included a closed Facebook group in which participants were able to share their experiences during the project and receive support and advice from other participants and the project team. Participants also reported their news in the Facebook group after the project. Furthermore, the experiences of the participants were disseminated in the local media and on Sitra's website. After the final workshop, a total of eight public or private service providers and local policy-makers were interviewed on their thoughts about the upscaling potential of the experiments. Four of these informants also participated in the workshop. Lastly, four members of the project team were interviewed about their views on the aims of the project and how these aims were achieved.

The study on the Give Up Your Car project was based on participants' self-reports of their experiences. At the beginning of the experiment in January 2015, each participating household was asked to describe their everyday mobility prior to the experiment by completing a questionnaire. During the experiment, the participants wrote about their experiences a total of three times. In June 2015, after the experiment had ended, the participants replied to some additional questions regarding their experiences. A follow-up

questionnaire was then sent six months later in December 2015, in which the participants were asked how their everyday mobility had changed after the experiment. Each participant also completed a mobility diary, which served as complementary material for the questionnaires. To gain background information and the organiser's perspective on the project, the two representatives of the public transportation operator who were responsible for organising the service were interviewed.

The last case study focused on the changes to everyday practices resulting from participation in leftover lunches, which were organised in three schools in Jyväskylä. I visited all three schools providing leftover lunch in November 2015 and interviewed the cook in charge in each school, as well as the service manager of the catering firm before my visit. These interviews, as well as a thorough reading of newspaper articles and other material available on the service, served as background information for the study. I ate lunch at each school, and during the meal I conversed with the diners and observed how the lunch event was organised. I also interviewed a total of 24 diners in their homes after the meal (six interviews were conducted by phone). The interviews focused on the everyday life and food practices of the informants. They also completed a background information form and one-week food diary after the interviews.

The interview data were transcribed and analysed together with the data from the self-reports using Atlas.Ti. The coding was performed on the basis of the consumption areas (housing, mobility, eating, leisure time activities, tourism and household goods) and then on the different practices within these areas. The analysis was guided by the need to understand the processes of change resulting from the experiments, the effects of the experiments on the elements constituting the practices and their connections, as well as the interdependencies and path dependencies of the practices. The other need steering the analysis was related to the changes underlying the reductions in the participants' carbon or material footprints, as there are many practices within the domain of 'everyday mobility' or 'housing' – and these practices do not always follow the boundaries of consumption domains.

The results, as presented in articles III–V, are based on the findings I considered most interesting in terms of the way everyday life changed (or failed to change) as a result of the experiments, how the new practices were maintained and why the changes occurred in the manner observed in the study (see Yin 2014). In all three studies, the experiments significantly impacted the participants' everyday life, including surrounding practices that were not the direct target of experimentation. Conversely, however, the interdependences and path dependencies of practices also defined the outcomes of experiments.

4.2.2 METHODOLOGICAL CONSIDERATIONS

The three case studies provide a good overview of the variety of projects implemented in Jyväskylä. The leftover lunch service originated from one of the 14 experiments based on the ideas of local residents, whereas Give Up Your Car was a part of the Bus Leap pilot and Future Households was an individual project. All the projects had a strong focus on environmental sustainability and mundane practices, including mobility and eating (although the leftover lunch experiment approached eating primarily from the perspective of school canteens).

The major differences between these three cases relate to the organisation of the experiments as well as the role of the organisers in relation to the participants. Whereas the Future Household and Give Up Your Car projects targeted a small number of participants, the leftover lunch service was, from the beginning, open to anyone interested. Unlike the first two projects, in which households were the main focus of the experiment, the target of the leftover lunch service was schools – more precisely, the school canteen and its waste management. In the Future Household project, the project team provided the participants with constant support, and the experiment period was very intense. By contrast, in Give Up Your Car, the public transport operator played a minor role during the experiment and the participants received no additional support.

The role of the author of this dissertation should also be noted: in the Future Household project, I was a member of the project team and thus participated in project meetings throughout its duration. However, my role was primarily to collect the data, whereas the other members of the team had the main responsibility for planning and organising the trials. Similarly, my role was to collect the data in the Give Up Your Car project. The local transport operator was responsible for organising and coordinating the project, selecting the participants and providing the travel cards. In turn, the experimental phase of the leftover lunch service had already ended at the time of the study, as the service had been made permanent and had been running for two years. The methods of organising the projects were thus beyond my control, but, conversely, the organisers of the experiments had no influence over the studies. In the Future Household project, the MF results formed a vital part of the project, and I also provided the organisers with an overview of the interviews, as it represented valuable feedback on the project. In Give Up Your Car, both the carbon footprint results and an overview of the participants' experiences were shared with the public transport operator, and they were also used as feedback.

There are a number of issues regarding the methodological choices in the studies. The first concerns the choice of cases and the way the studies were

framed. Case selection was driven primarily by availability: the timing of my research project in the final months of the TRW project meant that there were only a small number of on-going projects. Nevertheless, the cases are representative of the variety of experimentation that occurred in the TRW project and the different approaches to the issues of sustainability and sustainable consumption. In addition, the cases revealed rather similar dynamics of practices across the experiments, which made, in the terminology of Flyvbjerg (2001), the cases 'critical'. The studies (especially those in articles III–V) nevertheless focus quite strictly on the perspective of the participants in the experiments; by contrast, the other side of the experiments – that is the organisers, funders and the municipal authority – received far less attention. This is because the primary interest of the dissertation was to investigate the role of participants and practices in experimentation. Although data were also collected on the experimenters, the data have primarily served as background information for the studies, along with material from the media and other sources.

The second issue relates to the timespan of the studies. The length of the experiments varied from two weeks – the initial duration of the leftover lunch experiment – to one month of active experimenting with Future Households and six months of free travel cards in the Give Up Your Car project. Nevertheless, the studies cover a longer time span, due to follow-up interviews and questionnaires. Although Article II (which was written immediately after the end of the Future Household project) is rather optimistic about the role of four-week trials in establishing new routines, Article III adopts a more critical perspective on routinisation processes and argues that temporary interventions instead merely provide 'windows of opportunity' by enabling households to deliberate on their routines and trial alternative solutions. The six-month duration in Give Up Your Car (together with the financial incentive), in turn, proved sufficiently long for new routines to be established (Article IV).

Third, the sample size in each case was small (see Table 3) due to the limited resources of experimenters and the communicative role of experiments. Thus, the scope of the study is inevitably limited, which should be noted when drawing conclusions on the basis of the studies. Nevertheless, there are also advantages to the small scale, as its aim was to capture the richness of everyday life by drawing on intensive interactions with participants (Bickerstaff et al. 2015; Devaney & Davies 2016). As Flyvbjerg (2001) notes, concrete and context-dependent knowledge is valuable as such, even though it cannot provide generalisations and universal rules. Small-scale case-study work and in-depth methods are essential for understanding the complex formation of the meanings, perceptions, values, intentions, motivations and

normalities that are embedded in practices (Aro 2016; Bickerstaff et al. 2015; Keller et al. 2016).

The methods used to capture this 'richness' also have shortcomings. As a method, diaries and self-reports inevitably produce data that vary in quality – some people are more thorough than others, there are omissions and flaws, and there is a risk of misinterpreting the data. However, the interviews, especially those conducted in a series, made it possible to check the interpretation of the data gleaned from other sources. In addition, I had the opportunity to call the participants and ask additional questions or clarification or remind them about missing diary entries. Data collection for footprint calculations is laborious for participants, and thus we tried to make it as easy as possible – thereby possibly losing some data. However, as the purpose of footprints is not to provide precise figures but to illustrate the scale and the ratio of different consumption components, this level of accuracy was sufficient for our purposes.

In qualitative research, ethics also require careful consideration. I asked the subjects for their consent to participate in the studies, and they had a right to refuse or withdraw their participation at any time. Moreover, my research aims and the use of data were explained at the beginning of each interview. When it comes to the footprint calculations, each participant had the opportunity to enquire about the results, and those who did were sent the results along with a description of the methods used. Most of the interviews were conducted in the participants' homes or by phone, and they were assigned pseudonyms to preserve their anonymity. Nevertheless, maintaining the participants' anonymity, especially with such a small group of subjects, is challenging. Furthermore, some of participants also actively shared their experiences in traditional and social media, and thus it was also possible to identify them from the journal articles that comprise this dissertation. In the case of the leftover lunch service, the participants were mutual acquaintances and thus knew whom had been invited for interview – moreover, they may have been able recognise their fellow diners from the journal article.

The fourth issue is related to the use of practice theory as the theoretical framework of the studies – a choice I made in order to capture the complexity of everyday life. As also noted in previous studies (see, e.g., Keller et al. 2016), it can be challenging to specify what exactly constitutes a practice. 'Having a leftover lunch' could be interpreted as a new practice, as it clearly involves different meanings for 'having lunch' – in 'having leftover lunch', the element of food waste prevention was present in almost all interviews. In addition, to qualify as a practice, an activity should, in principle, be "describable in an instruction manual" (Warde 2014), and one indeed exists for the leftover lunch service (Sitra 2014). Nevertheless,

identifying individual practices, or even 'bundles of practices', in particular domains of everyday life is rarely unambiguous. This challenge is also present in articles II and III, which approach the theme of sustainable consumption from different perspectives: as Article III demonstrates, an exclusive focus on the environmental effects in each consumption area ignores the variety and complexity of practices that do not follow the borders of specific consumption areas.

Another related point is that the experiments' design was not guided by practice theory. Consequently, the projects did not, for example, follow the guidelines of Spurling et al. (2013); rather, the use of 'practice lenses' was limited to the analysis of the projects by the author of this dissertation. However, as the experiments were part of the TRW project, which sought ways to change existing patterns of production and consumption, they nevertheless resembled practice-oriented interventions. For example, the visual representation of material footprints in the Future Household project prompted the participants to reflect on the practices related to each consumption area, thus providing a fruitful starting point for a discussion on how practices are formed and how they could be changed.

Finally, experiments are, by nature, prone to surprises and unexpected outcomes. The whole methodology of this research has been open and exploratory in the sense that the methods were defined by the experimental settings within each project. The aim was to gather as rich a data set as possible, as the projects were short-term and it would have been impossible to collect some of the relevant information after they had reached completion. As a consequence, due to limitations of space, much of this data set remained unused in the journal articles and served mainly as background information. Thus, the articles represent only some aspects and perspectives of the experiments, primarily those serving the aims and purposes of this research.

5 RESULTS

In this section, I synthesise the findings of the meta-study and the three case studies by answering the research questions presented in the introduction and reflecting on the results in the light of the literature. First I address the question of what can be expected from a local experiment and, more precisely, what can an experiment can achieve and what is the role of each experiment in experimental governance (Section 5.1). Second, I explore what can be learnt from an everyday practice perspective on experiments, including how experiments are integrated into the participants' system of everyday practices (Section 5.2).

5.1 WHAT CAN BE EXPECTED FROM A LOCAL EXPERIMENT?

To answer the first research question, this section describes the TRW project and the case studies within the framework of the triangle model of experimental governance. The model illustrates what can be expected and gained from experimentation, how the experiments could influence each other and the kind of contexts in which the experiments are embedded.

The range of experiments included in the TRW project is extremely diverse, from home labs to procurement of novel energy technologies and reforms in public transportation. Experiments often vary in complexity, as illustrated in the triangle model (see also Article I). Experimenting concerns testing new ideas, learning from them, and creating new products and services and adapting them to new contexts. The TRW project provided an arena for analysing experiments and experimental governance as a local phenomenon. The project acted as an umbrella for a variety of experiments ranging in scale. The project can also be viewed as a 'resource-wise lab', similar to the low-carbon labs described by Heiskanen et al. (2015). The approaches employed in the experiments studied (Articles II–V) and the other experiments in the TRW project clearly combined ideas from both strategic niche management and transition management. As a whole, the project utilised the methods of TM in developing visions, building an agenda and creating networks, facilitating and steering local experiments and projects and monitoring and evaluating progress (Rotmans & Loorbach 2009). Nevertheless, the portfolio of experiments themselves was generated and implemented at grassroots level by different actors, in line with the ideas of SNM.

Analysis of the experiments with the triangle model suggests that most of them aimed to test a new service or technology. They were largely intended

to plant the 'seeds of change': they were quickly implemented and strove to encourage new ways of thinking and to 'trial behaviour' that could become mainstream in the future (Figure 3; Table 1). As Capstick et al. (2014: 432) note, such experiments are "not intended primarily to achieve actual emissions reduction at any meaningful scale; rather, they are designed to test and develop research concepts and/or best practice". These experiments were primarily organised by a few dozen local people and a small number of NGOs. However, thousands of people participated in the experiments during the TRW project. The lessons learned from each experiment were reported and disseminated by Sitra and the media, and these experiences were exploited when designing the following pilot projects. For local actors, these experiments served as trials for discovering what really works. By contrast, for Sitra the main lessons were related to the organisation of experimental projects in general. Consequently, such experiments could contribute to sustainability transitions even if they hold only limited transformative potential themselves.

For an experiment to exert a more profound influence (or to ascend up the triangle, see Figure 3), it should succeed in producing social learning and evidence-based recommendations on how to implement the results (Luederitz et al. 2016). In this, some of the experiments indeed succeeded. For instance, the public transportation experiments and the feedback they produced have led to changes in organising the provision of public transport (Article IV). Moreover, the aim of the Future Household project was to facilitate learning by organising a final workshop in which actors from different areas gathered to discuss the participants' experiences and the results of the project (Article II). Thus, the targets of the experiments were not only the participating households; rather, the experiments were also linked to the production of goods and services. For the public transport operator, the participants' experiences provided concrete information on insufficient routes, inadequate timetables or other reasons for not using buses. These experiences, together with the lessons learnt from other experiments organised in the Bus Leap pilot project, helped the public transport operator design further experiments, such as testing free bus rides for parents with prams in order to facilitate their use of buses – and this experiment, for instance, was made permanent after the trial period. The resources available for organising these experiments were also larger than for the initial smaller experiments: they were better staffed and funded and ran over a longer period. While it is too early to estimate the longer-term impacts of the experiments, they nevertheless helped in providing public transport operators with new capacities and a new kind of agency and in clarifying the means to achieve sustainability goals (Laakso 2017).

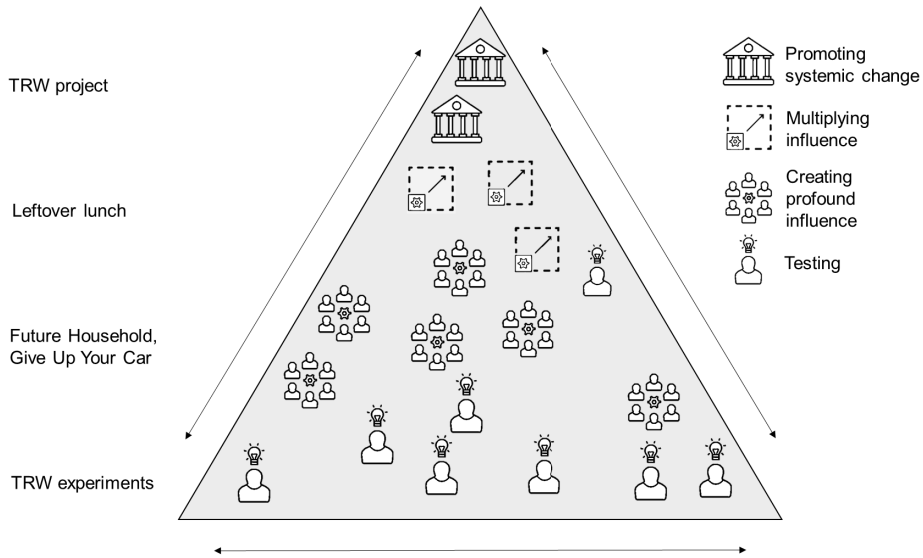

Figure 3. Experimentation in Jyväskylä in the triangle model of experimental governance (Laakso et al. 2017).

Closer to the top of the triangle, the influence of the experiment can be multiplied outside the niche. The leftover lunch service (Article V) is an example of a multipliable experiment: not only has it been regularised in Jyväskylä, but it has also spread around Finland and contributed to the discussion on the role of municipalities and other public sector actors in food waste prevention. The leftover lunch service is also an example of an experiment that 'travels' across the triangle: it began as a two-week trial to test how school canteens could operate new services and how they could be organised together with the primary task of feeding the children. On the basis of these experiences, the service was eventually adopted by every school in Jyväskylä and by other municipalities around Finland (Article V). As recommended in Sitra's guidelines (Sitra 2014), often the service is initially tested on a smaller scale to discover the best ways to organise it in each municipality. The service also demonstrates that successful experiments do not always require high levels of resources or expertise. The service spread because municipal workers acted as agents of change and began organising the service and because Sitra provided a step-by-step guidebook for arranging the leftover lunch trials. Moreover, the role of diners as active agents in the experiment should not be underestimated, as it was the number of participants – and thus the reduction in food waste – that was the key target of the experiment, and peer validation was a central precondition for people joining the lunch service (Article V).

Finally, at the top of the triangle, experiments can contribute to change in (local) policies and cultures, although such an impact may often be beyond the direct scope of the experimental projects themselves. Instead, it was the link between the project and the local authority and local policy-making that enabled the outcomes of the TRW project to be extended outside the project. In its entirety, the TRW project can be seen as contributing to changes outside Jyväskylä, as it initiated a nation-wide FISU network of Sustainable Cities and established the concept of 'resource wisdom', which remained in active use among city administrators and was also adopted outside Jyväskylä.

The vertical and horizontal dynamics of experiments illustrate the situation in Jyväskylä, as well as in many other cities and municipalities. Under the umbrella of local experimental projects, experiments of varying complexity are simultaneously conducted – coordinated by certain people but organised by 'everyone'. They might engage the same local people, and they are discussed in the local media and bounded by the same infrastructural factors. The following pilot projects utilised the lessons learnt in the TRW experiments, and, on the basis of these pilots, further smaller experiments were conducted. The experiments are thus overlapping and parallel. Beyond the individual projects, for municipalities networking in projects such as CANEMU or FISU, sharing information and experiences is important for understanding the connections between patterns of consumption and production and local structures and cultures. Instead of focusing solely on individual experiments and the potential to increase their influence and to contribute to transitions, there is thus a need to view projects holistically and consider how a given municipality interacts with municipalities in the field of experimental climate governance.

5.2 What can be learnt from an everyday practice perspective on experiments?

The three case studies aimed to illustrate the perspective of participants in experimentation and the ways the experiments were embedded in the system of everyday practices. From the perspective of the organisers of experiments, such as the City of Jyväskylä, Sitra, the public transport operator and the school caterer, the aim of the experiments was to test new services and find win-win solutions for minimising food waste, to learn about experimentation as a new mode of operation and as a means of communicating services, or to provide a concrete demonstration of more sustainable lifestyles. However, the participants' perspective on the experiments was rather different: it did not concern learning lessons for future experiments or developing a concept to be copied elsewhere; rather, it concerned novel behaviour that had to be

accommodated into the existing organisation of everyday practices. From this perspective, two issues arise: first, how are everyday practices formed and how are they interconnected and in what ways these interconnections affected the outcomes of experiments? Second, what are their social dynamics and how are they reflected in the performances of the practices?

In terms of the first issue, practices are combinations of elements that competent performers of a given practice must link and integrate to perform that practice. The experiments in the case studies primarily targeted the material aspects of practices. For instance, in the Future Household project, this meant the provision of various new services, such as on-demand buses and car sharing, while in Give Up Your Car the experiment provided a free travel card, and for leftover lunch diners the experiment was the lunch itself, with the school acting as the site in which the lunch was served. By applying methods such as backcasting, the Future Household project also strove to provide new meanings for everyday practices and orientations towards changing behaviour. The Give Up Your Car project, in turn, highlighted the monetary savings accrued when changing from driving a car to bus use. The manner in which the experiments were framed thus already illustrated the new combinations of elements, and some participants managed to incorporate these new constellations into their everyday lives without struggle. Leftover lunch diners, for instance, highlighted how important it was not to waste food, and they felt they were doing the right thing by eating a lunch of this kind. Some of the participants engaged in the mobility experiments welcomed the chance and incentive to learn how to use a bus, combined with the freedom from needing to maintain a car (Articles IV; V). If, however, bus use fails to conform to the meanings and standards of good mobility and the competences required for planning and combining trips by bus are lacking, or if it is too difficult to carry groceries from door to door, people are likely to revert back to driving (Articles III; IV).

Everyday life is "crammed with all sorts of activities" (Halkier 2013: 223), and from the perspective of the individual, it contains a strong element of path dependency (Røpke 2009). For many participants, experimenting meant re-organising many of their everyday practices. Despite the fact that the participants in Future Household and Give Up Your Car had volunteered to participate in the experiments, had indicated their motivation to participate and (in the case of Future Household) were even able to choose the trials they wished to engage in, the results reveal that many participants were surprised by the complexity of everyday life and its implications for experimenting (Articles III; IV). This was especially true of the Future Household project, where trials in different areas of consumption were conducted, and where the experiment led to a one-month 'upheaval'; however, also in the other two experiments, changes in one practice were

Participating in a daily leftover lunch, for instance, changed not only practices of food preparation and storage, but also practices related to running errands and exercising (Article V). Giving up the practice of using a car, in turn, changed the ways people visited their friends and relatives, engaged in recreational shopping and purchased food (Articles III; IV). These examples illustrate the interconnection between practices and how re-crafting practices or substituting practices (using the terminology of Spurling et al.) also changes other surrounding practices – and, conversely, how these surrounding practices need to support the change.

Daily mobility, which linked many other practices together, proved particularly difficult to change. Infrastructural factors and the (in)sufficiency of public transportation, for instance, define the ways in which people are able to move during the day and complete their daily tasks, such as working, shopping, engaging in leisure time activities and visiting their family (Shove et al. 2015; Southerton 2013; Article IV). Expectations at work might require the use of one's own car for business trips or make teleworking difficult, and taking children with all their sports equipment to leisure time activities by bus proved too much of an effort (Articles III; IV). These examples of 'mobility burden' – the combination of the spatial and temporal characteristics of visiting friends or relatives, being at work, going to school, and so forth (Shove & Walker 2010) – must be acknowledged when intervening in everyday mobility. The findings suggest that instead of persuading people to solely use public transportation, which they deem insufficient (regardless of the veracity of this opinion), it might make sense to persuade people to give up their cars by providing support for multi-modality (i.e. using bicycles and carpooling to complement public transport use) and to minimise the need for driving, in order to promote the parallel processes of 'fossilization' (Shove & Walker 2007).

With regard to the second issue of social interplay, what actually happens in experimentation is due to the ways in which practices are negotiated and organised in combination with other practices and reproduced or transformed through inter-personal associations (Halkier 2013). Social groups vary in their understandings of practices, of what constitutes competent performance and of the elements that 'should' be appropriated in order to perform any practice in a satisfactory fashion (McMeekin & Southerton 2012; Articles III; V). Understanding the outcomes of experiments requires attention to the differentiated ways in which groups engage in practices and how different communities either support or prevent change. In some contexts, driving one's own car is self-evident and alternatives such as carpooling might be considered strange, whereas other contexts are formed specifically around sharing rides; thus, it is clear that the same experimental approaches will not work in both these contexts (Article III). Feelings and emotions – often underestimated elements of a practice – are tied to collectives and what it means to perform a

III). Feelings and emotions – often underestimated elements of a practice – are tied to collectives and what it means to perform a practice in the 'right way' on the basis of the standards and norms of the social context. They can strengthen either the positive or negative experiences of participating in an experiment and thus affect the role people take in distributing the lessons learnt and in receiving future initiatives (Irvine & Kaplan 2001; Article IV).

However, change must always have a starting point. Practices constantly change – having a daily shower, for instance, is a relatively new phenomenon that has emerged hand in hand with changing perceptions of cleanliness (Shove 2003). A practice perspective on experiments encourages us to imagine what the 'new normal' of sustainability might resemble and suggests possible trajectories towards it (Spurling et al. 2013). This was also the aim of the Future Household project, in which participants acted as 'pioneers' of more sustainable lifestyles (Articles II; III). Although practices such as daily showering have spread from being the routine of the few to the routine of the many (Shove 2003), the case studies in this dissertation demonstrate that being a pioneer was difficult for most of the participants and that feelings of being different tend to be avoided. Being a frontrunner in sustainable practices might cause embarrassment and thus might even be hidden from other people (Article III). Consequently, participants in social experiments often prefer to adhere to old practices rather than distancing themselves from their collectives by breaking the perceived rules of normality. However, such experiments might also open the door to new communities, such as virtual communities in social media (Heiskanen et al. 2010; Article III). The daily leftover lunch, in turn, began to perform the function of a commensal meal for the participants, most of whom lacked the opportunity to have a family dinner (Article V).

The results of the case studies demonstrate, on one hand, how those willing to change their consumption habits and participate in experiments to find the means to do so are hampered not only by inflexible infrastructures and temporal demands, but also by social expectations, rules and preferences. On the other hand, the results illustrate that the participants also play a role in (re)structuring the practices in question and thus in the outcomes of experimentation. For instance, in Give Up Your Car, the new routine of bus use was not established as expected, and the experiment ultimately concerned the replacement of private driving with other modes of transport. The success of the leftover lunch service was primarily based on peer validation and people informing their neighbours about the service in a way that encouraged others to join the lunch. With regard to practices, the division between those who govern and those who are governed by experimentation is thus rather complex (see Macrorie et al. 2015). The participants became more skilful at and committed to changing their

everyday lives, as the experiments not only provided new competences, such the ability to use public transport or engage in car sharing, but also new understandings and reflexivity related to sustainability and what change would look like. This was considered valuable, as people are often unaware of the environmental effects of their consumption, which constitutes a barrier to the inclusion of environmental considerations in practices (Røpke 2009; Article II). Although not all the experiments led to permanent changes in practices, the experiences gained in them might lead to changes in the future (Article III; IV).

The findings described above illustrate the implications of an everyday practice perspective for experimentation. Practice theory recognises the complexities of everyday life as the context of experimentation and reveals the factors behind the unpredictability of experiments. As Gram-Hanssen (2011: 76) notes, practice theory "is open for understanding how changes in practices may start in the everyday life of individuals, following from both change in engagement and from the introduction of new knowledge or new technologies". The experiments are strongly mediated by existing routines, location, the sociotechnical fabric of actual and potential actions and by the parallel patterning of related practices (Aro 2017; Shove & Walker 2010). While experimenting, attention should be paid to the subjective experiences of participants, the interdependencies and path dependencies of practices and the social relations that they support and uphold and which, in turn, ensure that those practices are maintained, stabilised, reproduced or challenged (Davies & Doyle 2015; Hargreaves 2011; Kent 2015). Although the experiments might seem 'small scale' from the perspective of the organiser or other actors, for the participants the experiments might have signified changes in the entire organisation of their everyday life – and it is this organisation that defines the outcomes of experiments.

6 DISCUSSION: A PRACTICE APPROACH TO EXPERIMENTAL GOVERNANCE

Thus far, the dialogue between practice theory and experimental governance approaches has primarily remained at the conceptual level or has focused on current practices rather than on the evolution of practices in a more sustainable direction (Davies & Doyle 2015; Hargreaves et al. 2013; McMeekin & Southerton 2012). This section takes the experiences of participants and uses them to bridge these two approaches.

Practice theory is, as Kent (2015) describes it, a theory of process that outlines the trajectories of practices – how they develop, recruit carriers, change, and die. Practices change when their constituting elements change or when the links between practices are forged or broken (Jaeger-Erben et al. 2015; Spurling et al. 2013). Experiments may be the seeds of transitions, but "the environment into which these seeds are sown is, of course, the main determinant of whether they will sprout" (Mokyr 1990: 299, cited in Geels & Schot 2010: 24). Contrary to the impression given by examples of congestion schemes or teleworking hubs (Shove & Walker 2010; Spurling & McMeekin 2015; Spurling et al. 2013), and as Heiskanen et al.'s (2015) examples of local climate experiments demonstrate, new practices cannot simply be 'dropped into' people's everyday lives.

Although there is abundant research on experimental governance approaches (such as the approaches of SNM and TM), the participant perspective has thus far been mostly neglected. However, as the practice-theoretical insights of the case studies (Articles III–IV) illustrate, the dynamics of everyday life is crucial for the outcomes of experiments. The relative stability of practices (and complexes of practices) as entities is the result of the constant reproduction of these practices as performances, and the potential for change lies in these dynamics. Fostering sustainability transitions thus requires an understanding of the impact of experiments on a range of everyday practices, a revealing of the elements and dynamics promoting or preventing the change and an acknowledgement of what is 'doable', possible and socially acceptable in everyday life (cf. Evans et al. 2012; Halkier 2013; McMeekin & Southerton 2012).

Consequently, what insights could practice theory provide for experimental governance? Here, I return to van den Bosch and Rotmans' (2008) mechanisms of deepening, broadening, and scaling up and use some examples from my case studies.

Although the TRW experiments were mainly understood as means of creating an enthusiastic atmosphere among residents and other actors in Jyväskylä, quickly testing the utility of ideas and demonstrating the concept of resource wisdom (Berg et al. 2014; Mattinen et al. 2014), it is important to note that these are also the processes through which *new practices emerge*. Agents configure a new set of activities by integrating new combinations of existing elements into their daily lives or combining new elements with exiting elements, and what matters is the way in which the constituent elements fit together (Pantzar & Shove 2010; Røpke 2009; Shove & Pantzar 2005). Transferring knowledge through demonstrations of new practices is a powerful way to stimulate change, as experience with various practices affects the future practices an individual is willing to engage in (Article III). In addition, it is obviously important which practices an individual actually encounters and has access to (Røpke 2009; Article V).

The results show that not all innovations have to introduce technological novelties – the experiments promoting car-free life by providing an opportunity to test alternative, existing modes of mobility (Articles III; IV), or the experiment extending the lunch service to cover groups other than school children (Article V), exemplify the fact that social innovations, and finding new ways of organising old services, can be successful. The key is to find a new combination of elements that comprise a more sustainable practice and to avoid focusing merely on some aspects of a practice. The practice perspective reveals how social contexts, infrastructures and the organisation of household routines all have an impact on what actually occurs as a result of experimentation. In short, understanding practices and their social foundations is important if experiments are to accelerate the change towards sustainability. In addition to creating more sustainable practices, there is also a need for an "unmaking of unsustainability", such as giving up the practice of driving private cars (Shove 2010b: 282; Article IV).

The experiments employ the mechanism of deepening if they are able to foster collective learning and familiarity (Heiskanen et al. 2010; 2015; Seyfang & Haxeltine 2012). *Deepening* refers to the process through which a novel configuration of elements diffuses through its adoption by others in such a way that a new practice can emerge as a provisionally stable and recognisable entity. As McMeekin and Southerton (2012) note, experiments will only matter in sustainability transitions if they play some part in reconfiguring collective practice. Although frontrunners might play an important role in introducing technological novelties in TM, the case studies demonstrate that being a pioneer in sustainable everyday practices may be more complicated. However, experiments can create opportunities for people to gain a picture of a more sustainable everyday life, provide them with new materials and competences and allow them to embrace new meanings. This

could result in the alteration or abandonment of existing practices or the adoption of new practices, at least when circumstances, contexts or life situations change (see Heiskanen et al. 2013; McGuirk et al. 2015; Article III). The leftover lunch service, in turn, was able to cover a variety of practices: the service was situated at a point where practices (of both provision and consumption) and meanings (such as the importance of food waste prevention, prioritising a social meal over a solitary one and providing a daily rhythm) could be altered simultaneously in a suitable context (a nearby school that was easy to access and provided the necessary infrastructure).

The experiments also indicated the need for new means of governance and collaboration – thus creating grounds for further action (Articles II; IV). This is a valuable contribution, as innovations in various programmes and policies are often introduced on a large scale without the benefit of first trying them out (Irvine & Kaplan 2001). Previous experience creates confidence and provides skills for project organisers that are difficult to learn in any other way (Heiskanen et al. 2013): the public transport experiments, for instance, provided knowledge and competences that were employed in later experiments (Laakso 2017).

Nevertheless, learning is often limited to a specific context, and the same experiment in another context with different networks, institutions and cultures would almost certainly yield (at least partially) different outcomes (van den Bosch & Rotmans 2008). The elements of a given practice – such as meanings, competences and technologies – thus need to 'travel' from one context to another, within and between niches and regimes, for the outcomes of experiments to be *broadened* (Shove & Walker 2010; Wieczorek et al. 2015). Broadening is also dependent on networks of people transferring their experiences to new contexts and others adopting these new elements and practices. Testing new services and technologies can provide valuable information on contextual factors: for instance, as the experiences of participants in the Future Household project show, the same practice can have very different meanings between social groups (Article III). These experiences are important for understanding why some experiments work in one context but not in another.

When it comes to *scaling up*, the leftover lunch experiment appears to have changed the practices of both municipal food services and local residents, before eventually becoming nationwide and, in part, changing the way we think about food waste (Article V). This illustrates the significance of finding the right point for an intervention: the leftover lunch service was able to address simultaneously both the food waste dilemma and the social aspects of eating. Although the conditions for scaling up were provided by Sitra, through its guidelines, and by the media, through disseminating news about

the service, the broadening of the service was due to the activity of the school canteen workers, and the way the service became rooted in other municipalities was dependent on how the service managed to attract diners. Thus those performing and reproducing the practice have played a key role in its diffusion. This also illustrates the parallel processes of deepening, broadening and scaling up.

The evaluation of the experiments in the TRW project was limited to reductions in GHG emissions and the use of natural resources (Mattinen et al. 2014; Articles II; IV). What the practice perspective on experiments illustrates is that the evaluation of experiments based on their environmental outcomes provides an incomplete picture of the impacts of experiments and their transformative potential. Although the experiments were able to reduce GHG emissions or the use of natural resources, the reasons behind the changes varied among the participants. As practices do not exist in isolation, the real target of an experiment might not be what was originally planned, or there might be unforeseen consequences, such as the improved wellbeing of elderly people in the neighbourhood (Article V). Environmental effects can also be externalised to other families through carpooling or to service providers in the form of home-delivery (Articles II; III). It is thus fruitful to use approaches that cross the borders of consumption areas and reveal the connections between practices.

These findings are also a reminder that experimentation is not an all-powerful solution for mitigating climate change and achieving sustainable lifestyles; rather, it is a tool for indicating the multitude of issues that need to change and a potential starting point for these changes. Changes occur hand in hand with shifts in the infrastructures, institutional arrangements and systems of governance that provide the context for the performances of practices. To identify the preconditions for a sustainability transition, we need to understand the dynamic relationship between the formation of practices and these contexts in which they exist (Moloney et al. 2010; Røpke 2009). In addition, there is a need to change not only the practices performed by individuals and households, but also those of schools, workplaces and municipalities. In the case of the leftover lunch service, the school provided a place for eating together, which was seen as an important factor for participating in the lunch. Instead of clinging to individual experiments, it is thus important to perceive experimental governance as a sequence of cumulative interventions in which each experiment plays its own role (see Spurling & McMeekin 2015; Article I).

To sum up the discussion, analysing the projects from the practice perspective revealed interdependencies and path dependencies that would have remained hidden if the focus had been solely on evaluating the reductions in the environmental burden. In addition, focusing on larger scale

governance processes within the TRW project, or within the network of municipalities, overshadows the many processes within and between everyday practices that are nevertheless important for understanding the outcomes of experimentation. The results of the case studies support the findings of previous research, and strengthen the notion that practices (such as having lunch or driving to work) are to some degree universal and socially shared while nonetheless tied to the prevailing circumstances, local infrastructures and social contexts. Focusing on the ways normalities are maintained might reveal the means to change them and make sustainability the new norm (Aro 2017; Butler et al. 2016). A focus on practices, their interconnections and their social dynamics thus reveals new perspectives on experimental governance.

7 CONCLUSIONS

The contribution of this dissertation lies in bridging the gap between practice theory and the aims, means and mechanisms of climate governance experimentation. By building specifically on the experiences of participants in local experimentation, the dissertation focuses on the conditions necessary for policy makers to promote regime shifts via experimentation and on the perspectives that a practice approach can offer for such endeavours. This concluding chapter outlines some of the insights the dissertation provides for science and policy making.

The attempts of experimental governance to deploy new technologies or social innovations in cities and municipalities outside the traditional channels of centralised authority have proved diverse and promising (Bulkeley & Castán Broto 2013; Heiskanen et al. 2015; Hoffmann 2011). However, management approaches to experimental governance lack an understanding of the means to steer mundane practices onto more sustainable pathways. Although there are many examples of successful interventions (see Strengers et al. 2015), we lack knowledge of the influence of experimentation in the sphere of everyday life – in other words, *how* and *why* experiments change practices (see Shove 2014; Shove & Walker 2010). The challenge is to understand people's initial involvement in reproducing the systems in question – and the ways the organisation of practices affects the outcomes of experiments. This dissertation fills this gap by illustrating the role of the 'micro-politics' of everyday life in experimentation. Zooming in to the level of individual households might seem irrelevant in the sphere of climate governance led by large cities (Hodson & Marvin 2010), and the perspective of participants has indeed been much neglected in previous research on experimental governance. However, it is precisely at this level that experiments and their outcomes are experienced, negotiated, challenged and adopted.

The scholarly relevance of this dissertation can be summarised by three interrelated issues. First, the findings illustrate the importance of studies on subjective experiences related to various practices and the need for research on people's *feelings about experiments and the impact of experimentation on their social relationships*. Although sustainability transitions require changes in practices as entities, a focus on the performances of practices is crucial for any intervention, as it sheds light on individual learning and experiences (as called for by e.g. Sengers et al. 2016b; van den Bosch 2010), the role of social interplay (Article III), the stability of certain practices despite intervention efforts (Article IV) or the popularity of experiments (Article V).

Collective perceptions of normality steer, to a high degree, understandings of acceptable or unacceptable actions – and hence underpin the stability of practices. By adhering to community norms, the 'stigma' of locating oneself in a different practice from one's friends and colleagues is thus avoided, although this might be the necessary starting point for the new practice to emerge in the community (Hargreaves 2011; Nye & Hargreaves 2010). Thus, experiments that rely on recruiting pioneers might prove difficult (Articles III; IV), whereas experiments targeting neighbourhoods and communities (Article V) could be more successful. Collective experimentation can foster familiarity and a sense of belonging, whereas individual experimentation can effectively identify the normative aspects preventing change within each context (Articles I; III). Although emotions and other 'individual characteristics' have received little attention in practice theory (Halkier 2013; Kent 2015), these feelings and meanings arise from the 'social' of social practices and are thus of great importance in the process of the emergence, change or disappearance of practices (see Butler et al. 2016; Moloney et al. 2010).

Secondly, by adding the practice theoretical perspective to the analysis of local experiments, the dissertation emphasises the value of gaining a deeper understanding of the *complexities of, or implicit connections between, practices, and how new materials, meanings and competences are embedded in the lives of the people performing the practices.* These issues are crucial in either the acquisition and integration, or the discarding, of a combination of elements, and thus for the diffusion of the practice (see Røpke 2009).

Transitions in practices cannot be fully planned, predicted or managed. The effects of an experiment will depend on the ways it intersects with the existing elements of the practices that it seeks to re-configure as well as on practitioners' responses to these dynamics (Evans et al. 2012; Shove & Walker 2010). It is important to note that as practices form complex connections, experiments can alter practices that were not originally targeted and reductions in the environmental impact of one consumption area can lead to an increased impact elsewhere (Article III). In addition, the findings demonstrate that ordinary people are not mere parts of networks and niches; rather, they are *active agents of change* in experimentation, adapting the new elements of experimentation to their system of everyday practices – an issue rarely discussed in studies on experimental governance. This also raises the issue of who governs who in experimentation and reminds us that without the people performing the practices there would be nothing to broaden or scale up.

The third insight provided by the dissertation is that *different experiments are effective at different stages*: testing can 'tweak' the composition of

elements and provide valuable information on the formation of and connection between practices and their potential for change (Article I), as well as provide experiences and foster familiarity on the new practices. However, for more profound change to occur, a greater focus is needed on the collective performances of practice. Moreover, more fundamental changes are required in the organisation of practices and the way they are embedded in specific contexts. For a practice to gain influence in a variety of contexts, we need to understand the different ways the practice is performed within those contexts and the conditions for the diffusion of elements between them. As the TRW project and the experiments in Jyväskylä illustrate, a broad range of experiments nurtured an enthusiastic atmosphere and provided learning experiences for the different actors organising the experiments, thus allowing new experiments to be designed on the basis of these experiences.

The triangle model of experimental governance (Figures 2 and 3) is a step towards a holistic framework within which many types of experiments can be analysed. It also reminds us of the value of experiments – and their transformative potential – even when they are not broadened or scaled up. However, as the case studies demonstrate, the 'buzz' around local experimentation failed to extend everywhere, and some participants would have required more support, a wider repertoire of options to test, or a more collective effort to change the practices targeted by the experiments. What is also important to note is that new or modified practices must find a niche within the existing system of practice and there is thus a need to mutually support the disposal of practices (see Shove & Walker 2010).

This dissertation also provides insights for policy making. By analysing experiments from the perspective of practice theory, this dissertation provides concrete findings that can be utilised by the organisers of experiments, including policy makers promoting experimental governance, to design, evaluate, learn from and make wider use of experiments. Give Up Your Car managed to dissuade people from driving by targeting a life transition, such as moving house or retirement, during which the participants would have needed to restructure their everyday practices in any event. By visualising the environmental effects of consumption, the Future Household project made mundane routines visible and open for scrutiny, and by simultaneously targeting multiple practices highlighted the links between different consumption areas. The leftover lunch project succeeded in providing a space for the right combination of elements and practices and in creating a concept that could be broadened outside the initial setting. The results also demonstrated, however, that experiments which 'isolate' the participants or focus solely on one aspect of a practice, such as providing monetary incentives, can have partial or unexpected outcomes. Experiences

from pioneer households on perceptions of normality might prove fruitful when developing new forms of collaboration, such as carpooling or co-housing.

Using practice theoretical approach to analyse experiments and creating a dialogue between participants and other actors in experimentation may expose the missing competences, contradictory meanings, insufficient technology or other elements underpinning stability or change in a given practice. It would be useful to understand the precise aims of the experimenters in a certain experiment – whether they are striving for knowledge production, or change in practices – and the means at their disposal for achieving these goals. A focus on practices and their dynamics can reveal new areas for experimenting, such as combining interventions in housing and mobility, and can also provide an understanding of the conditions necessary for experiments to have a wider impact. This is also in line with the finding that qualitative research is needed to complement quantitative results on GHG emission reduction or the impact of experiments on natural resource use. By combining GHG emission reduction calculations and estimates of reductions in natural resource use with a qualitative study on household-level change and the way their constellation of practices evolved due to the introduction of a new technology or service, this dissertation provides not only measures of environmental impact but also explanations of the success or failure of experiments to trigger changes in practices.

The dissertation also provides insights for practice theory scholars. Practice theory is widely used to study the development of mundane practices such as showering (Shove 2003) and eating (Warde 2016) or to gain in-depth understanding of other practices in everyday life (Evans 2012; Rinkinen 2015). This dissertation complements previous research by providing a perspective on experiments as accelerated social change or a disruption in everyday life and by illustrating the changes in the dynamics of practices that they entail. Experiments might serve as an arena for observing shifts in practices or identifying which elements prevent them from changing, and what future practices might resemble. Experiments can even reveal 'surprising' connections between practices and shed light on the feelings and emotions linking practices together. A focus on the participants in experimentation facilitates analysis of the role of individual actors during these disruptions and the social interplay through which practices are reproduced. As the case studies in this dissertation demonstrate, the stability of practice complexes in the face of external shocks, or the extent of reflexivity that experimentation might yield in practices, for instance, might be potentially fruitful areas of study.

It is necessary to recognise the role of politics in experimental governance – a playing out of power regarding when to experiment and how to intervene (Shove & Walker 2007). Most importantly, this power is used to steer people and the way they live their everyday lives. Although this dissertation briefly examined the issue of agency in experimentation, interesting questions of power, ideology and the multiple uses of experiments (see Berg & Hukkinen 2011) were beyond its scope. Moreover, this dissertation lacks a discussion of practices in governance, experimentation as a practice or the wider contexts in which local experiments are embedded. The focus of the study would have been more balanced if it had also included the perspectives and practices of policy makers, municipal administrators, designers, funders and other actors conducting experiments. In addition, comparisons between the experiences of local people in Jyväskylä and those in other municipalities would have provided an interesting starting point for a discussion on the contextual characteristics of experimentation, as well as those of everyday practices. These questions offer interesting areas of study for future research.

As the number of social experiments is increasing rapidly, there is a pressing need to gain information on experimentation from different perspectives. This dissertation addresses this need by providing a participant perspective on experiments combined with practice theoretical insights for experimental governance. The dissertation suggests that a practice perspective offers a more exhaustive frame of reference for experiments, and, through its empirical case studies, the dissertation offers some concrete methods for governing changes in our everyday life. To conclude, this dissertation contributes to the view that *the outcome of an experiment depends on a complex combination of experimental approaches and mechanisms, the stability or elasticity of practices, the (social) context and the way individuals actively fit the new constellations of elements in their everyday lives*. Participants in experiments act at the intersection of everyday practices and local experimentation aimed at changing these practices. We thus need to look beyond experiments to the people themselves and their performances of practices. For them, what occurs is not just experimentation – it is everyday life.

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